the OIL AND GAS JOURNAL
JANUARY 12, 1959

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Political Pressures Run High in Venezuela

Many observers think companies can negotiate a better deal, avert future trouble by standing united against 10% tax increase. **p. 43**

D-X Sunray Proves Promotion Pays Off

Firm has managed to sell more gasoline in a tight market with its hard-sell campaign during the past 2 years. **p. 52**

Atomic Blast Seen as Key to Shale-Oil Problem

p. 58

How Close Are We to . . .

METHANE SHIPMENT BY OCEAN TANKER?

p. 76

Announcing a new book of utmost value to Designers and Users of Atmospheric Heat Exchange Equipment

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Velocity changes with height above ground; Daily changes in wind; Upslope and downslope winds; Sea and lake breezes; Winds coincident with high wet bulb temperatures; Determinations of predominant directions; Ranges of velocity; Cooling tower orientation.

DRY BULB DESIGN VALUES:

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INTERPOLATION BETWEEN STATIONS:

Variation in wet bulb due to elevation; Variation in dry bulb due to elevation; Variation in atmospheric pressure; Air mass modification; Influence of terrain and adjacent operations; Solar radiation; Influence of vegetation; Examples.

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Copies of "Evaluated Weather Data for Cooling Equipment Design" will be available beginning December 1, 1958, through the Fluor Representative in your area. Or, write direct to Fluor Products Company, Department DEW, Whittier, California.

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WHITTIER, CALIFORNIA

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Jan. 12, 1959

Odds are beginning to favor an oil-industry strike:

OCAW leaders have pretty firmly committed the unions to a strike unless they win some concession. Strike machinery has been started up—votes taken, notices served, warnings made.

Oil management seems just as firmly committed to its wage policy that economic conditions in the industry don't justify any increases in payroll costs.

Unless mediators can work out a compromise, a strike now seems certain within a few weeks. Labor predicts if one occurs, it will be a long shutdown (p. 47).

▼ ▼ ▼

Ticklish decisions are ahead for the oil industry in Venezuela. Tension over the new tax decree is mounting.

Feeling is growing among oil men in Venezuela and in this country that it's time to meet the issue headon, and attempt to negotiate a fair settlement with the incoming regime (p. 43).

Oil has some bargaining strength on its side. Any move to increase cost of Venezuelan oil will hurt its foreign markets. Unfair taxes will make the country unattractive for future capital ventures.

Canadian and domestic U. S. oil producers are secretly pleased with Venezuela's tax action.

Canadians feel the higher tax wall will tend to divert major-company capital from Venezuela to Canada. It may also encourage more support for the Alberta-Montreal crude pipeline. This proposed line would dry up an important market for Venezuelan crude.

U. S. domestic producers naturally welcome any move abroad which tends to increase the price of foreign oil. Uncertainty of foreign oil is one of their major arguments against imports.

▼ ▼ ▼

Canadian officials hope current Ottawa talks with U. S. delegates will end restrictions on flow of Canadian oil into U. S. markets.

Conference is labeled a trade parley. But for Canadians

oil has top priority on the agenda. They hope to persuade the Americans that free flow of crude between the two countries is vital for continental defense.

One indication oil is a major topic of discussion is appearance of Interior Secretary Fred Seaton as an extra U. S. delegate. His department deals with the import problem.

Toronto sources, meanwhile, report Canadian oil and gas interests look to new session of U. S. Congress with hope and fear.

They hope congressmen will ease restrictions on U. S. imports of Canadian crude. But they fear the lawmakers may impose additional barriers to Canadian gas.

▼ ▼ ▼

Commerce Refining officials privately aren't too unhappy at new delays in building their 43,000-bbl. refinery at Narragansett Bay.

Federal Court ruling last week restrained construction. But in view of current imports restrictions and low refinery margins, more delay doesn't dismay Commerce. The company is confident of ultimate victory and hopes when the plant gets on stream the economic climate is fairer.

Plastics prediction: A 10% production gain for 1959.

Survey by Society of Plastics Industry reveals a 5% production gain in 1958. Biggest gainer was polyethylene, up 30% to 920 million pounds.

The 1959 production of plastics raw materials should hit 5 billion pounds with a $2.5-billion value.

New air-freight idea could add to jet-fuel demand after airlines complete transition from pistons to jets.

Jet and turbo-prop "piggy back" freight planes are being considered by air cargo lines. Such planes reportedly will be able to carry 36 tons across the Atlantic at savings of 4 to 5.75 cents per ton mile.

Cargo would be wheeled on through huge rear doors similar to present Air Force piston cargo transports.

Refiners note: Monsanto will put the chemical industry's first computer-controlled chemical plant on stream this year.

A Thompson-Ramo-Wooldridge RW-300 electronic digital computer will be used. The control unit will be installed in an existing plant which already is highly instrumented by today's standards.

The computer will continually monitor process conditions, make numerous calculations, and automatically adjust the controls for greatest production from plant investment and least operating cost.

Monsanto has not yet identified the plant or process involved in the move.

Lube-oil marketers get a boost from researchers.

Radioactive testing by Gulf proves that auto engines wear out significantly faster when motorists fail to change oil frequently during cold-weather driving in city traffic.

Winter driving creates corrosive conditions in engines. These cause piston rings and other engine parts to wear out about twice as fast when oil change interval is advanced from 500 to 1,000 miles. Wear is four times faster when interval is advanced to 2,500 miles.

▼ ▼ ▼

Oil-tanker trade has a stake in London sessions of International Transport Workers Federation opening January 19.

Two leading U. S. maritime unions will propose organizing crews of U. S.-owned tankers and cargo ships operating under foreign flags. They will enlist ITWF support for a world-wide unionization drive.

If the plan succeeds, it could drastically change the present pattern of international oil traffic.

▼ ▼ ▼

Humble is going deeper at its Bear Creek Unit No. 1 on Alaskan Peninsula near Kanatak Bay.

Wildcat has drilled to 13,287 ft. without finding a producing sand. It's now scheduled to go to 13,500 ft. Increasing the depth goal is only indication of encouragement coming from Humble.

Report on offshore drilling from floating platforms shows:

...Speed has not been spectacular.

...Costs now have been reduced until they are comparable with land-drilling costs.

That's the experience of Dominion Oil, Ltd., which has been drilling wildcats off the West Coast of Trinidad for more than a year with increasing efficiency.

First well has been spudded under Argentina's new policy permitting U. S. companies to develop production on a contract basis.

Pan American is drilling at Cerro Dragon, a proven area 50 miles west of Comodoro Rivadavia. Well is first of 50 Pan American will drill this year in a 15-year, $60-million deal. Drilling should take 20 days.

Government oil agency, YPF, meanwhile is calling for bids on 4,500 wells. These will fill void left when a $800-million deal with firms controlled by Floyd Odlum and Williams Bros. fell through. Details on bidding are available at YPF'S New York and Duesseldorf offices. Closing date is February 17.

The Argentine oil search, meanwhile, will pick up steam this month when delivery starts on 20 identical Ideco portable

rigs to be shipped to YPF from Italy.

The Ideco H-40 Dual-Rambler rigs of 7,500-ft. nominal capacity are being mass produced in Florence, Italy, under license of Dresser, A.G. YPF reports that 10 similar rigs built for it in Beaumont in 1957 have cut drilling time by one-third in the Comodoro Rivadavia field.

▼ ▼ ▼

Pipeliners hear that a new 500-mile products line will be built in the Southwest this year.

Announcement by the major company involved can be expected in the spring.

1959 should be good pipeline construction year. More important, actual construction will get under way earlier.

That's report of R. P. Gregory, president of Pipe Line Contractors Association, just prior to group's annual gathering this week in Miami Beach. He also reports:

...Costs went up in 1958, labor up 4%, some heavy equipment up 7%, and nearly all materials up some.

...Prices received by contractors remained same (p. 46).

The $200-million Gulf Interstate Gas Co. has been sold to Columbia Gas System, Inc., its only customer. Name will be changed to Columbia Gulf Transmission Co.

Deal involved exchange of $67¾-million worth of stock and assuming by Columbia of $142-million debt on the 850 miles of mainline and 310 miles of gathering lines (p. 44).

▼ ▼ ▼

Oil industry and Government may team up for an experimental atomic blast which could revolutionize shale-oil business.

The experiment involves a pilot nuclear blast followed by in situ combustion in the blast area. Site would be in tremendous shale-oil deposits in Colorado (p. 58).

Object is to see if a recovery method can be used on a large scale to produce economically the nation's vast shale-oil reserves.

Plans for the test blast were talked over last week at a Dallas conference of oil, government, and scientific leaders.

▼ ▼ ▼

Washington hears: Venezuelan tax hikes were intended partly to offset anticipated clampdown on oil exports to the U. S....Federal health officials may seek legislation requiring tests of gasoline additives to determine their role in air pollution. In future additives may have to pass rigid tests prior to being used in motor fuel...FPC Chairman Kuykendall may be ticketed for a federal judgeship before Ike leaves office. Connole thus may wind up as FPC chairman.

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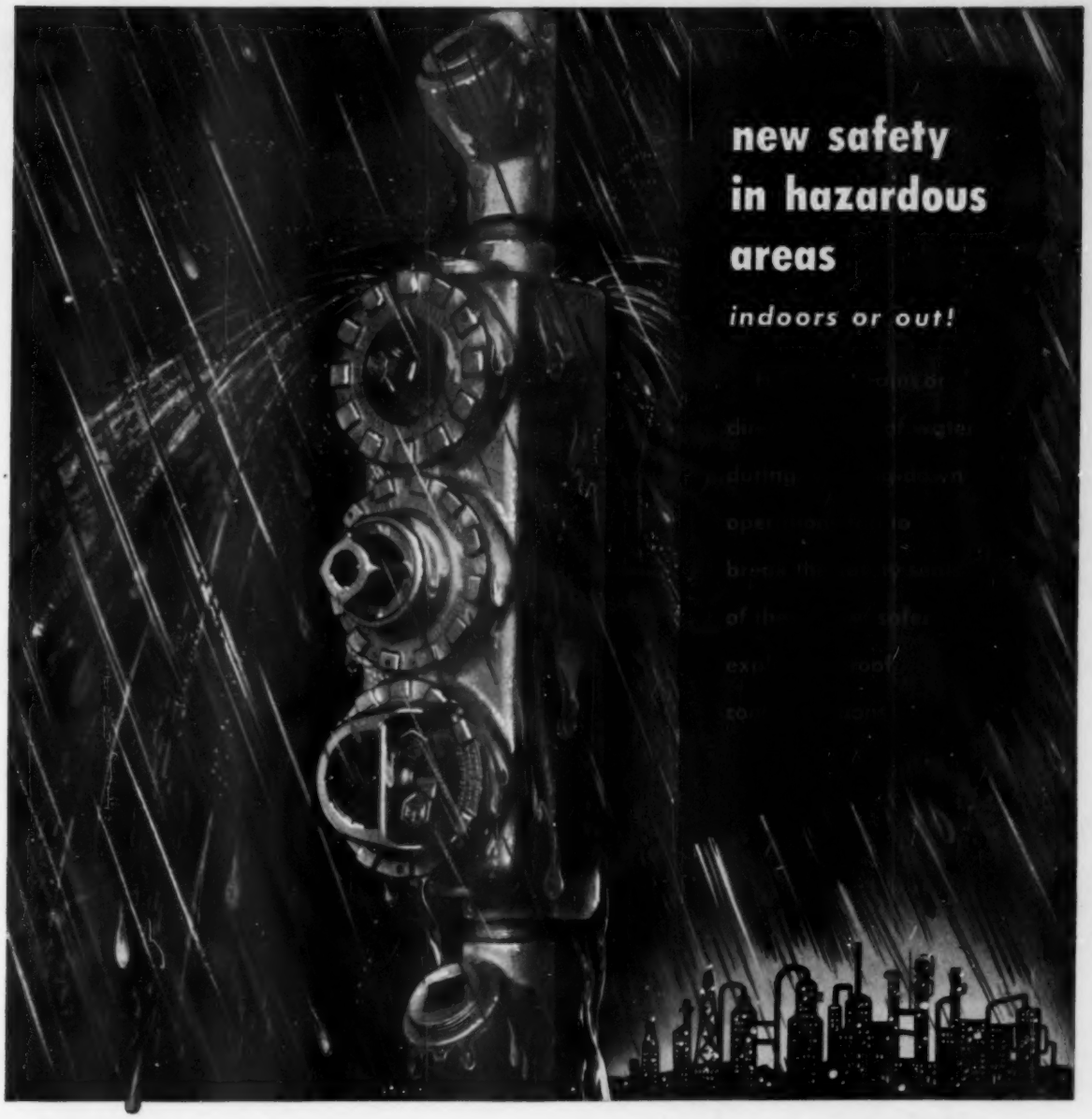

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OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
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TECHNOLOGY—OPERATION

General

Ocean Transportation of Liquefied Gases . . . 76

By Dr. L. Von Szeszich

This technique seems to be feasible economically and from an engineering-operating standpoint. When distance between source and market is 4,500 sea miles, regasified methane at the point of use would cost $0.512 to $1.324 per M.s.c.f. Thus the fuel would then be competitive in many spots around the world.

Drilling-Production

Unique Mast Ducks Under Height Limits . . . 75

Desert Rig Works on Wheels 82

Camdrill International, drilling contractors, is putting to work in North Africa one of the most completely unitized drilling rigs ever built and equipped. Rig-up and moving time will be a minimum because of its complete wheel-mounting on huge sand tires and because of unitized pumps, manifolding, and mud tanks.

Citric Acid Sequesters Iron in Water Floods 84

By W. E. Bell and J. K. Shaw

Tests on 354 water-flood and 92 disposal projects show that water is especially susceptible to citric acid treatment. There are four possible applications of this material: (1) Maintenance treatment; (2) acidizing with citric and hydrochloric acids; (3) citric acid plus detergent for cleaning injection wells; and (4) slug treatment.

Deepest Cement Job Is Routine 91

A 2,642-ft. liner was suspended 12 ft. off bottom in the Phillips 1-EE University 25,340-ft. wildcat test in West Texas. No difficulties were encountered.

Reservoir Engineering—4: Neutron-Derived Porosity Curve 100

By E. T. Guerrero and F. M. Stewart

This installment is devoted to the development of this curve when core-analysis porosity measurements and neutron log are available for a 53-ft. interval in a limestone formation.

Pipelining

Automatic Computation Speeds Pipeline-Investment Analysis 69

By T. R. Young

The application of automatic computation to economic analysis of crude-oil-pipeline investment has proved to be very practical. The computational work covers the basic design of a projected pipeline and estimation of construction and annual operating costs. These data are then used to develop financial information for evaluation of the proposed investment. Final output data are cash outlay and receipt schedules, payout period, and investment yield.

Refining-Processing

How to Select and Specify Process Equipment 92

By D. J. Oriolo

One of the most important functions of the process design of petroleum or petrochemical plants is to provide basic requirements necessary for the selection of all major process equipment and important process controls. This information serves as the basis for the final, over-all specifications on the equipment, as developed by detailed engineering.

Process Costimating 98

Optimum pressure for vacuum distillation and the amount of steam required.

Questions on Technology 102

Metals in Venezuelan crudes.

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Norris Suggests

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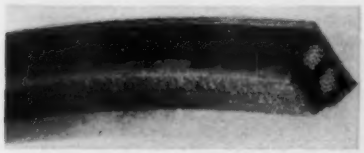
B.F.Goodrich V belt briefs

TIPS ON THE CARE, MAINTENANCE AND SELECTION OF V BELTS FOR INDUSTRY

What caused this V belt failure?



Appearance: V belt sidewall and bottom worn away.

Cause: Abrasion. Foreign material and rust in sheaves wore away sidewalls, causing belt to drop to bottom of groove.

Prevention: Use dust guards to protect against abrasion.

Use canvas covers to protect adjustment bolts

Rusty or corroded adjustment bolts at motor base make it difficult to adjust or install a V-belt drive. A simple way to overcome this problem is to cover bolts with a piece of heavy canvas. Then when an adjustment is needed, just lift up the protective canvas cover—adjustment bolts and locking nuts work like new.

HERE'S WHY GROMMET BELTS GRIP BETTER—*See all the rubber surrounding the twin grommet in this B.F.Goodrich belt? It has more rubber in relation to belt size than any other belt. Because the grommets are endless, have no stiff overlapping cords, they are more flexible, grip the sheaves better. Size for size, Grommet belts give ⅓ more gripping power with less slip. This stronger, more resilient construction gives the B.F.Goodrich Grommet belt 20% to 50% longer life. Yet it costs no more than ordinary belts.*

What do V belt sizes mean?

V belts are marked with a letter which indicates their width across the top and a number to indicate their length. Standard belt widths are coded: A (½″), B (21/32″), C (⅞″), D (1¼″), and E (1½″).

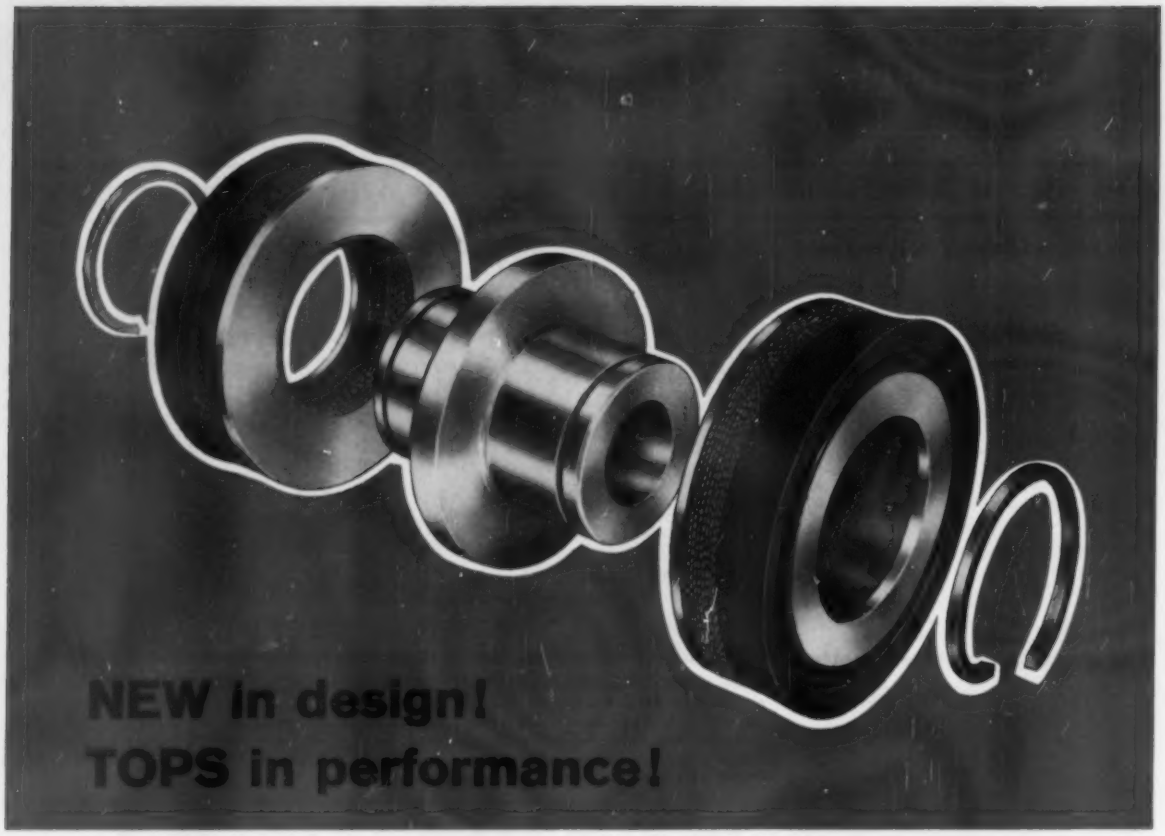
All high capacity V belts will be identified by the addition of the letter "P" as soon as present stocks are used up. For example, AP, BP, CP, DP and EP.

B.F.Goodrich V belt manual

The illustrated pages of this new B.F.Goodrich V belt maintenance manual contain information that will help you get longer life from your V belt drives. Its 12 illustrated pages contain information on how V belts work, how to select V belts that fit, how to install, how to keep them running, and how to spot trouble. To get your free copy, call any of these B.F. Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Hobbs, Oklahoma City, Tulsa, Dallas, Houston, Odessa, Wichita Falls. *B.F.Goodrich Industrial Products Company, Department M-507, Akron 18, Ohio.*

FIRST ADJUSTMENT LASTS TWO YEARS—*The B.F.Goodrich V belt drive on this mud pump stands shock loads, is subjected to all sorts of weather, sand and dirt. Yet it has been working for over two years without a shutdown or takeup since its initial adjustment—and it still needs no further adjustment, looks good for many more years of service.*

B.F.Goodrich V belts



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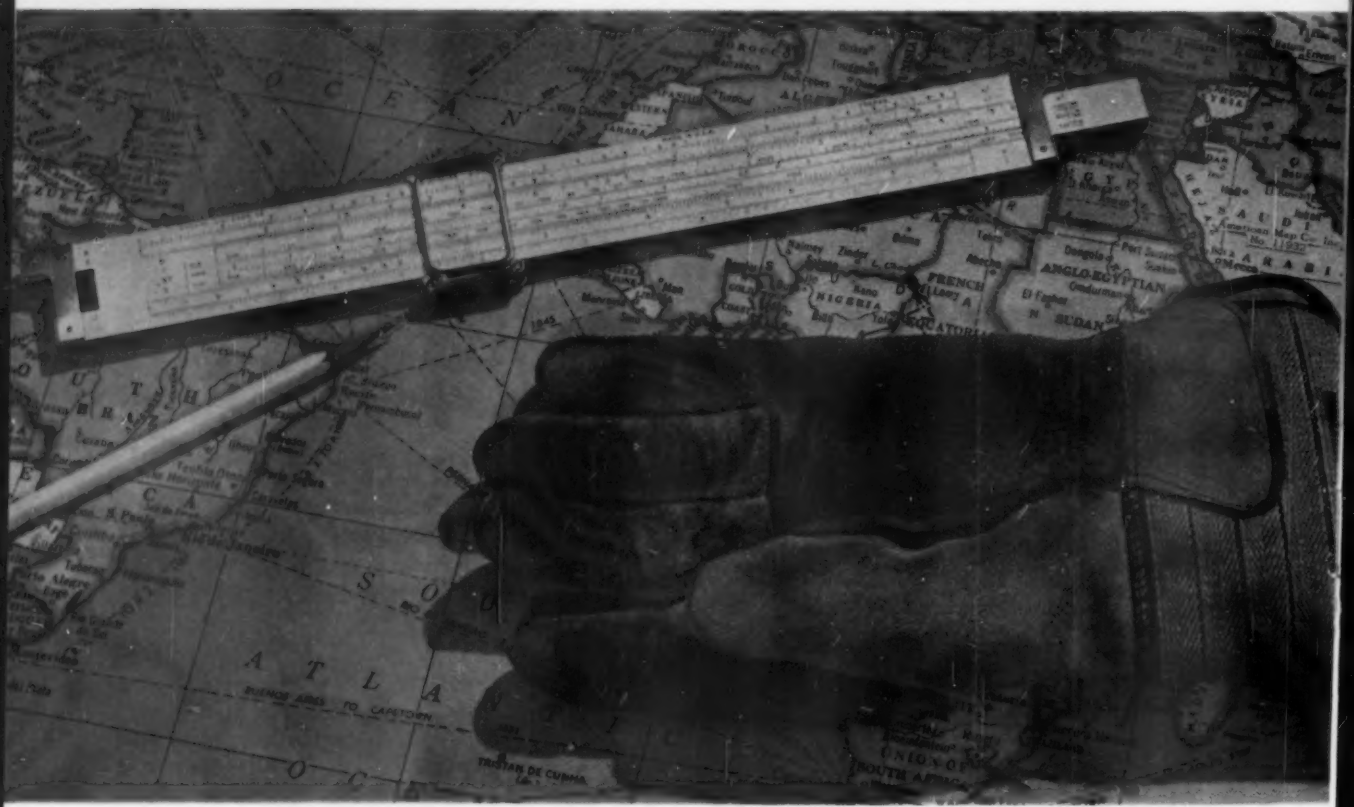

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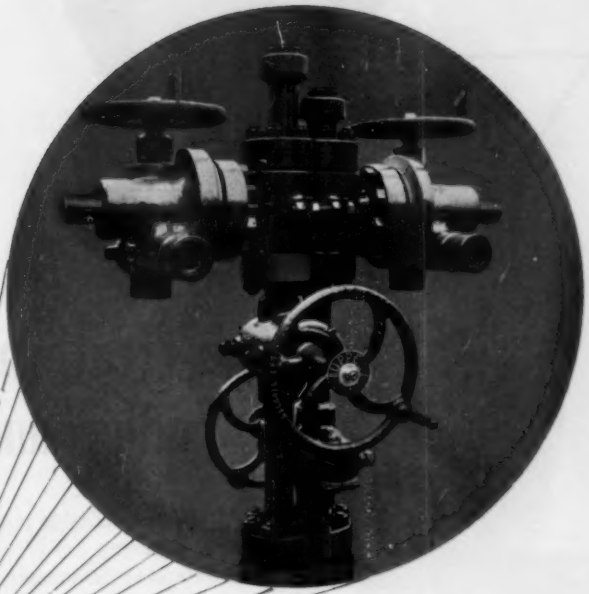
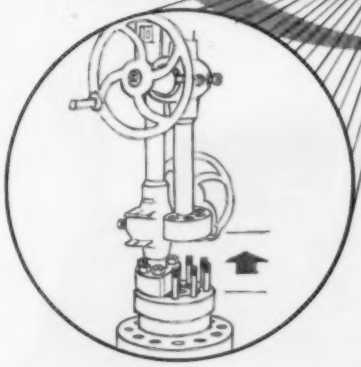
O·C·T CRESCENT FLANGE





gives dual tree flexibility, economy

Another major advancement from the leader in multiple well completion equipment is incorporated in the Oil Center Tool Company's Crescent Flange Tree.

It features: ★ Simplicity ★ Flexibility ★ Economy

All of these result from the fact that it is no longer necessary when the Crescent Flange Tree is used, to remove both valves in a dual well when one is to be replaced. The ultra-simple design allows you to replace one valve without disturbing the other.

The Crescent Flange Tree is the newest example of how the Oil Center Tool Company employs depth in research and development to deliver the best possible wellhead equipment.

For more details on the Crescent Flange Tree, check with the O-C-T representative nearest you. You'll be glad you did.

where progress is a daily practice

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OPERATION:
RESULTS!

Chemical Treatments by HALLIBURTON aid production recovery

The profitable results of remedial squeeze cementing, testing or fracturing are greatly improved by first doing a Halliburton clean-up treatment. With Halliburton's chemical aids, you get a better picture of production possibilities that warrant further development... and you do get better results from the operations that follow.

First, Halliburton Chemical Services can remove permeability blocks caused by water, emulsions and mud. Then, let Halliburton Fracturing Services further stimulate your well's production... for more oil in your tanks... and more profit on your books.

For operating results YOU CAN RELY ON, specify HALLIBURTON Chemical Services.

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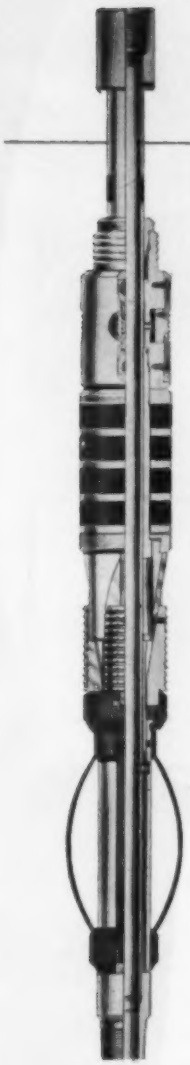
THESE HALLIBURTON PRODUCTS HELP PREPARE YOUR WELL FOR PROFIT



"HM" RETRIEVABLE PACKER

"HM" RETRIEVABLE PACKER ISOLATES ZONES FOR CHEMICAL TREATING

Proper segregation of the zone to be treated is accomplished with Halliburton's full opening Type "HM" Retrievable Packer. This versatile and rugged packer can be set again and again at any point in the well for treating different horizons.

HALLIBURTON'S MCA... AN EFFECTIVE MUD CLEANOUT AGENT

If normal permeability has been plugged by mud cake or by mud lost in the formation crevices and flow channels, the selected chemical constituents of MCA aid in softening the mud and assist in its removal. Natural oil flow channels are re-opened. On cementing jobs, cement is more firmly bonded to formations.

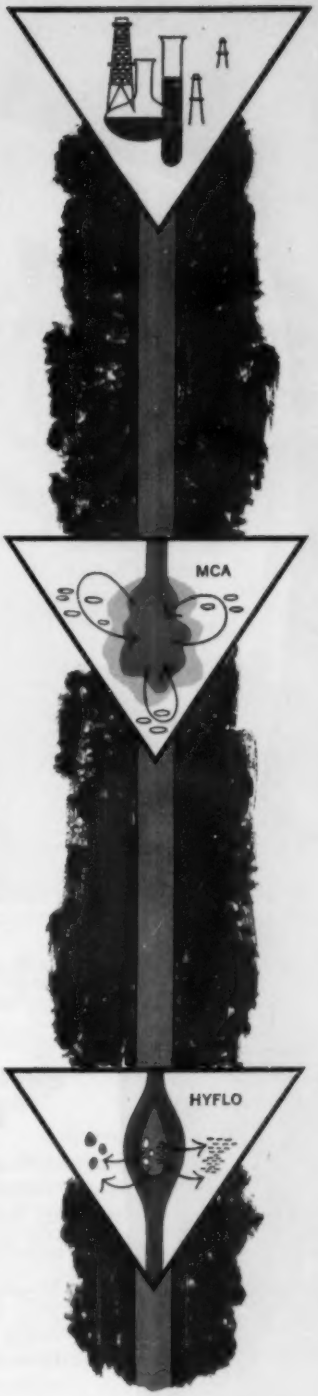
IMPROVED HOWCO HYFLO... BETTER THAN EVER FOR EMULSION BREAKING

Faster and more effective breakdown of water and emulsion blocks are made possible by improved HOWCO Hyflo. Through synergistic action, its component chemicals have increased effectiveness beyond their individual properties. This makes HOWCO Hyflo a rapid-acting "block-buster."

BETTER OPERATIONS RESULT

These Halliburton products for chemical service are not just valuable for releasing blocked production; they also help to determine whether a doubtful formation is capable of producing oil... to make primary and squeeze cementing more effective... and to improve fracturing results.

Put their benefits into your well by calling Halliburton ...today!



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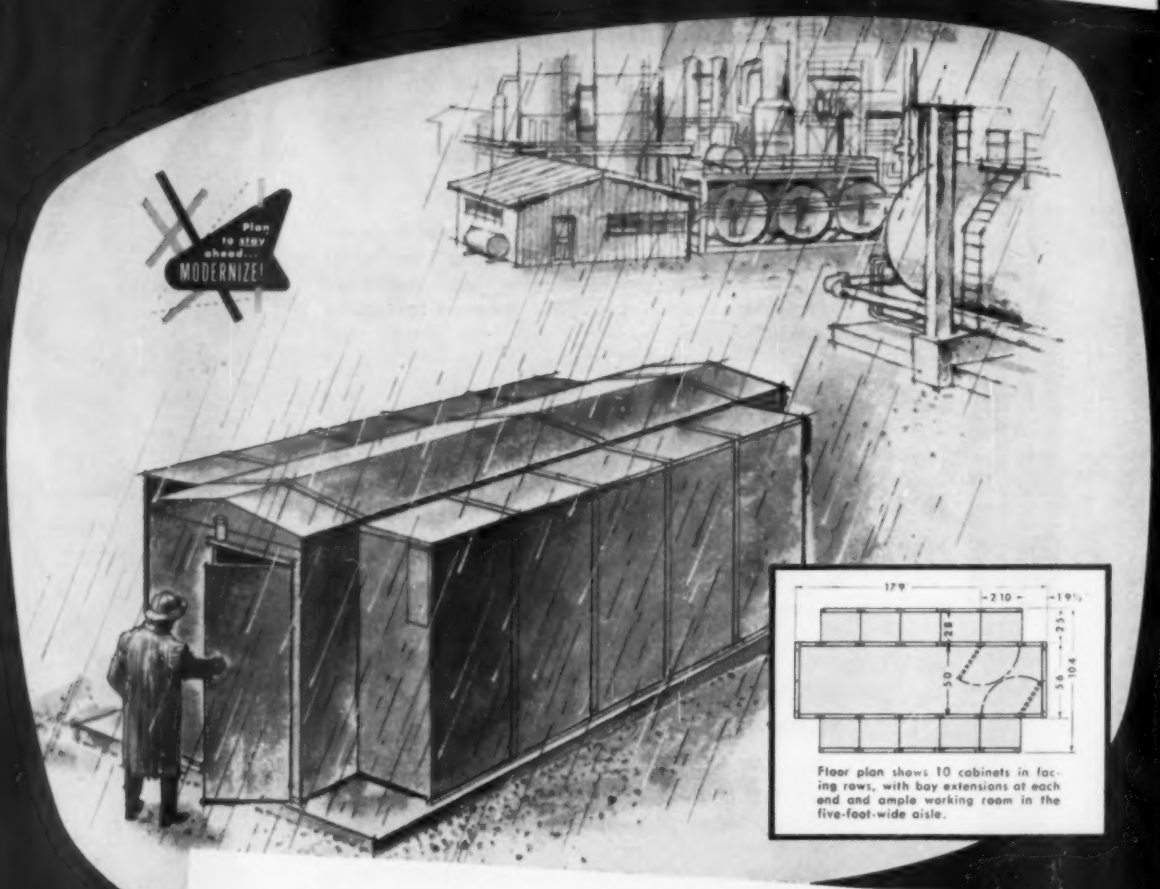


Floor plan shows 10 cabinets in facing rows, with bay extensions at each end and ample working room in the five-foot-wide aisle.

Let it rain, snow or blow...

New, *Shelter-Clad* walk-in enclosures provide complete protection for personnel and motor control

With the new Allis-Chalmers all-steel, walk-in enclosure, you can eliminate expensive, permanent buildings. Your field personnel can carry on inspection and maintenance work in complete safety and convenience, regardless of the weather. *Shelter-Clad* units can even be arranged to provide space for your field office work.

Simple, Flexible Packaged Units

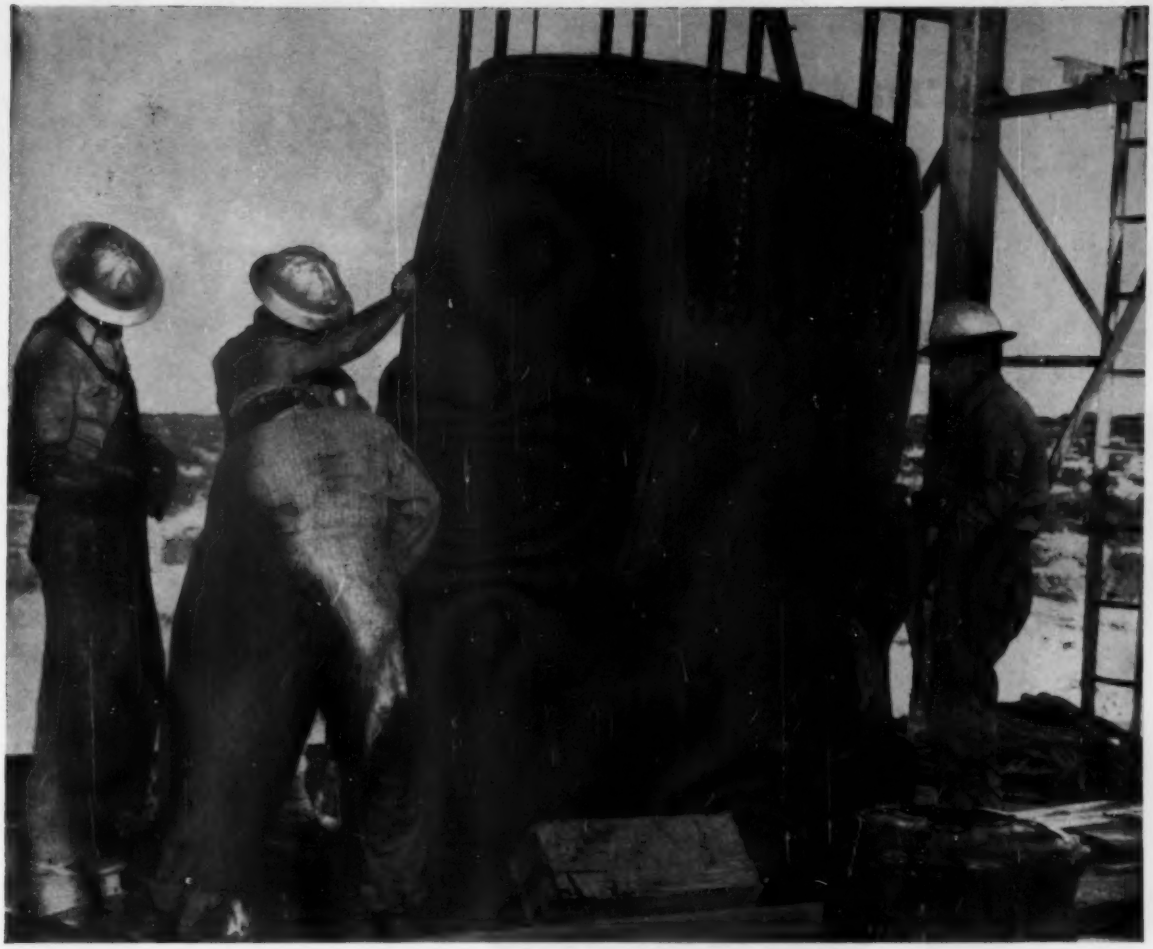
Two facing rows of Allis-Chalmers Type H, 2000 to 5000-volt motor controllers are bridged by a sturdy metal roof with the backs of the control cabinets forming the outside walls. A five-foot-wide aisle, extending the length of the unit, is enclosed with doors at each end. A basic unit can consist of any number of facing cabinets — and any number of pairs of cabinets can easily be added or removed. These units meet NEMA 3 and 4 standards for weather resistance.

For details, contact the A-C office near you, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

Shelter-Clad is an Allis-Chalmers trademark.

A-C ALLIS CHALMERS

A-5881



RIG UP WITH Regan!

Oil men everywhere rig up with Regan traveling blocks for faster, more economical drilling. The Regan Type-M traveling block, shown above on Great Western Drilling Company's Rig 44, was recently used in drilling a 23,400' West Texas test. This 500-ton capacity heavyweight falls fast and speeds the running of drill pipe into the hole. Regan blocks require a minimum of field maintenance . . . operate economically on any rig. Manufactured to extra precision-tolerances, these blocks are designed to allow complete interchangeability of parts. Because of their low center of gravity, Regan blocks travel straight in the derrick. For complete information on all Regan blocks, call your nearest Mid-Continent Supply Co. representative.

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. . . standard on LINK-BELT oil field roller chain

U.S. Patent No. 2,517,497

Increased sidebar Fatigue Resistance raises chain endurance limit . . . produces unmatched dynamic strength

No ordinary roller chain can long withstand the brute punishment of drilling service. That's why Link-Belt adds the FR process—a proven way to promote longer chain life. By compressing the metal around pitch holes, Link-Belt greatly strengthens the critical sidebar areas most vulnerable to fatigue . . . thus creating extraordinary *dynamic strength*.

And FR is just one of many Link-Belt "extras":

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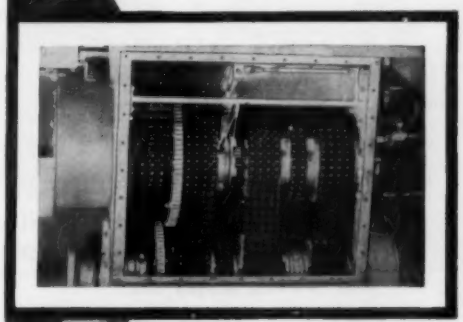
- PRE-STRESSING
- E-Z ASSEMBLY
- CLOSER HEAT-TREAT CONTROL
- SHEPHERD'S CROOK COTTERS
- DOUBLE BOXING

Any leading supply store in the field can give you full details and a copy of Link-Belt Catalog 2780.



BREWSTER N-12 DRAWWORKS TRANSMISSION incorporates multiple-width Link-Belt Precision Steel roller chain with FR. *Since this feature involves no alteration in dimensions of chain parts,* Link-Belt roller chain is interchangeable with standard chains and sprockets.

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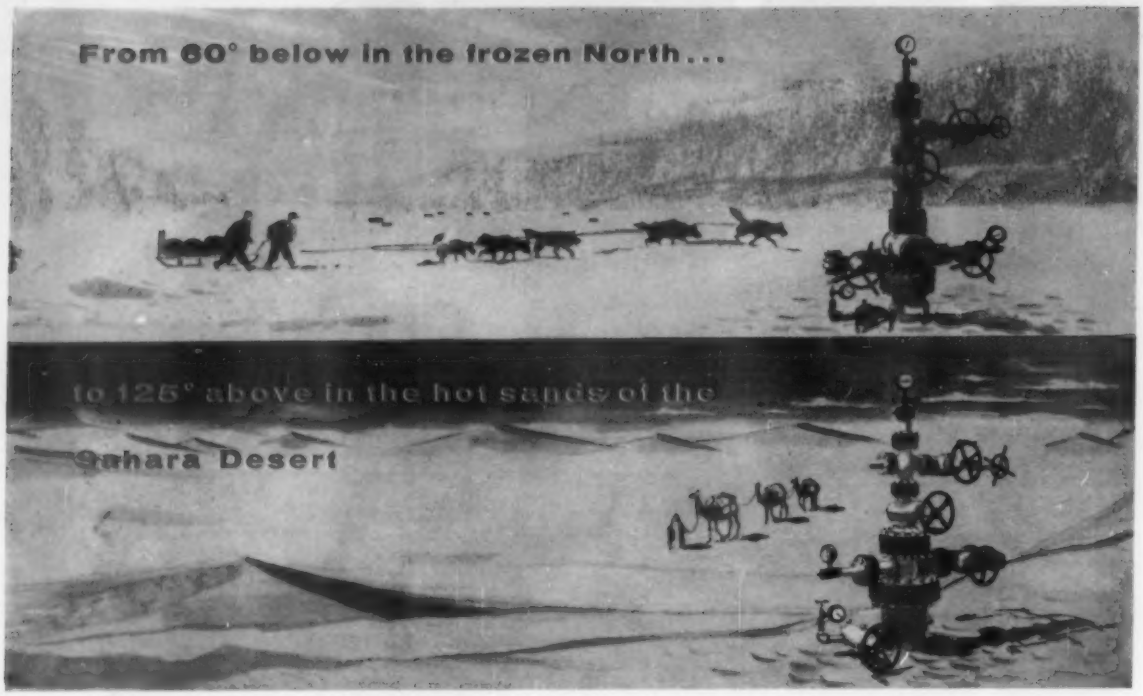

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Neither cold nor heat nor humidity can cause a Rector metal-to-metal seal Rectorhead to fail. In temperature ranges from 60° below zero to 850° Fahrenheit Rectorhead continues to out-perform all others. When you use Rectorheads you "seal-with-steel". The welded seal, plus API ring gasket, does not require replacement or maintenance. It is immune to corrosion inhibitors, will not "flow" under high temperatures nor freeze under low temperatures

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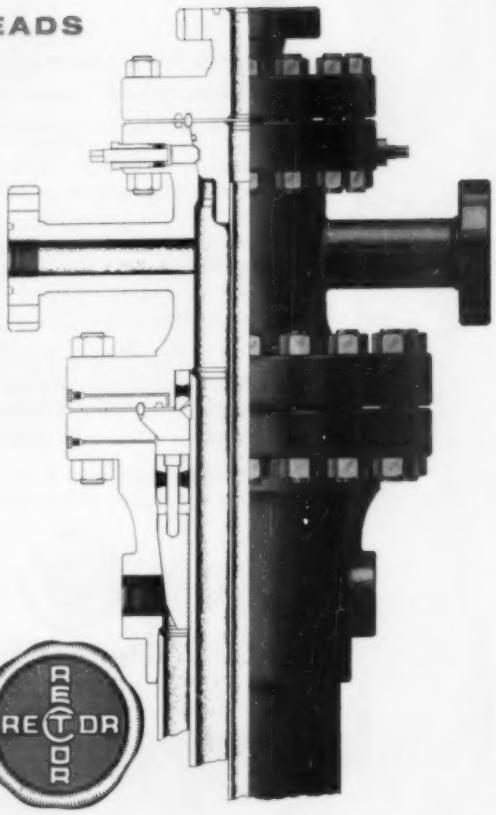

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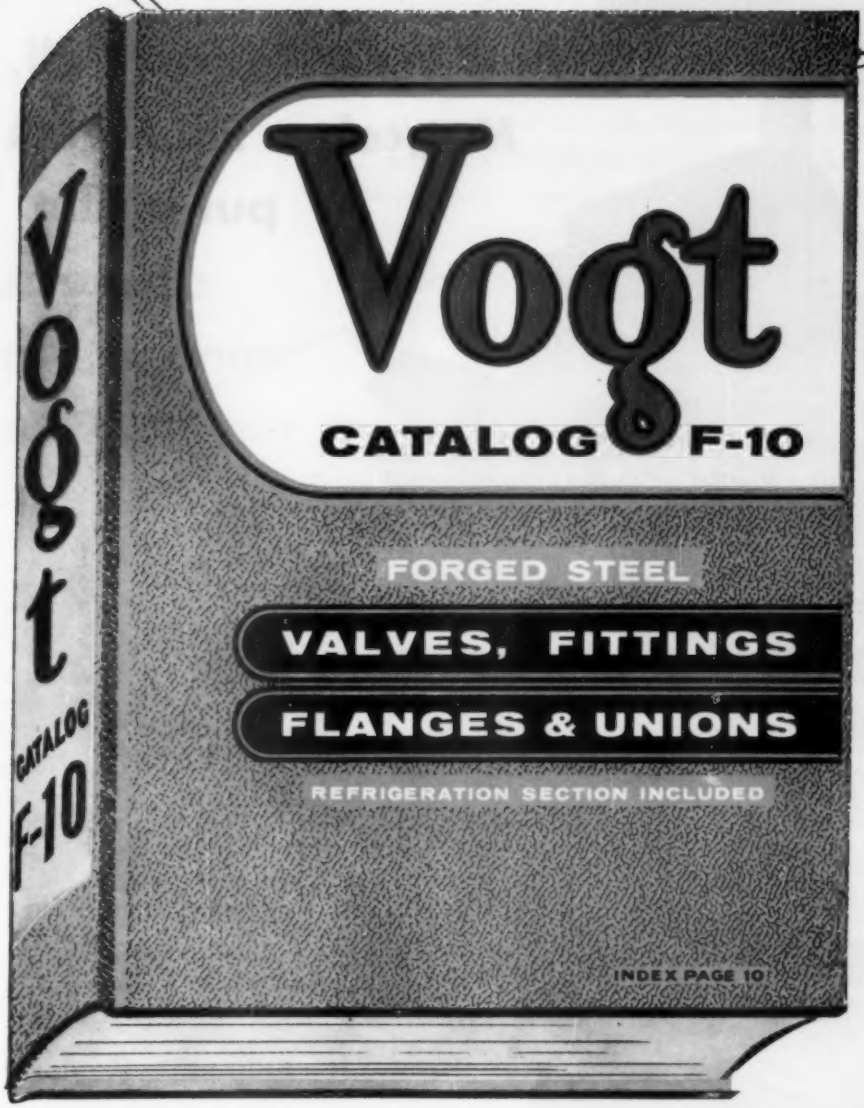

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HOW BIT

In a West Texas Well, Magcobar Engineers put a film here.....

Another Well Done *with*

LUBE AND MAGCOBAR ENGINEERING CUT DRILLING COSTS

You are always sure of getting every cost-cutting advantage with Magcobar. Here's why: The Magcobar Mud Engineer combines a thorough knowledge of drilling fluid chemistry with experience in your drilling area. This background—plus the top mud lab in the country—gives new dimension to the finest and most complete line of drilling mud products. What does this mean to you? The highest level of product performance to cut your drilling costs.

..... to make net savings of $4.87 per foot

Here's proof of actual savings using Bit Lube (E. P. Additive for Mud). The table below shows a drilling cost comparison in the Brownfield, Texas, area. The Bit Lube well was drilled for $4.87 per foot less than the offset well.

	NO. BITS	BIT SIZE	INTERVAL	ROTATING HOURS	WEIGHT ON BIT	RPM
BIT LUBE-WATER	28	7⅞"	4919-7272	185	70-90,000	60-80
WATER	40	7⅞"	4936-7270	379	45-60,000	55-60

Total savings in bits, trips, and drilling time was $13,420. Bit Lube and emulsifiers cost $1,940; a net saving of $11,480!

Bit Lube forms a tough protective film to reduce friction and to increase bit bearing life under extreme pressure conditions. It works best with high weight on the bit and fast rotary speed. Bit Lube and Magcobar engineering may be the answer to your bearing failures.

Bit Lube is only one of Magcobar's many answers to the problem of high drilling cost, a problem that demands the right answers. You'll find that the right products *used right* by Magcobar can cut costs on your next well, too.

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Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION
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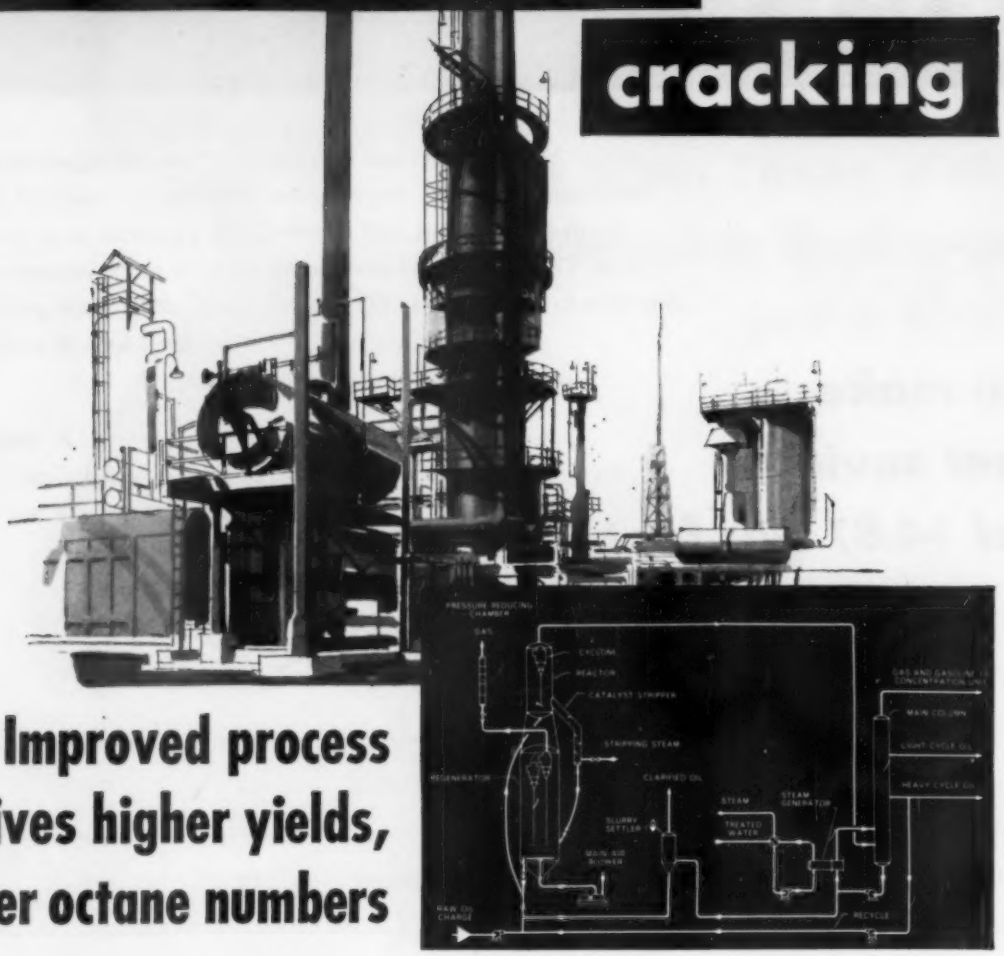
Magcobar Technology!

UOP fluid catalytic cracking



Improved process gives higher yields, higher octane numbers

An improved version of the basic and fluid catalytic cracking processes, UOP Fluid Catalytic Cracking converts low-value petroleum fractions to more valuable products. It produces gasoline, distillate fuels and gas for polymerization, alkylation, etc. under a better controlled, consequently more economical operation.

A less complicated, more easily operated, and efficient process, UOP Fluid Catalytic Cracking offers many advantages. The process requires lower original, operating and maintenance costs. UOP Fluid Catalytic Cracking gives longer on-stream time with minimum down-time. Catalyst inventory and consumption rates are low. UOP Fluid Catalytic Cracking can process either light or heavy oils including unvaporized feed stock. Positive contact between catalyst and charge stock assures efficient reaction and operation. Reactor space velocity can be changed, and reactor temperature controlled over a wide range to provide maximum flexibility in adjusting for various feed stocks or product changes.

Widely applied to refinery operations, UOP Fluid Catalytic Cracking offers a convincing record of proved performance.

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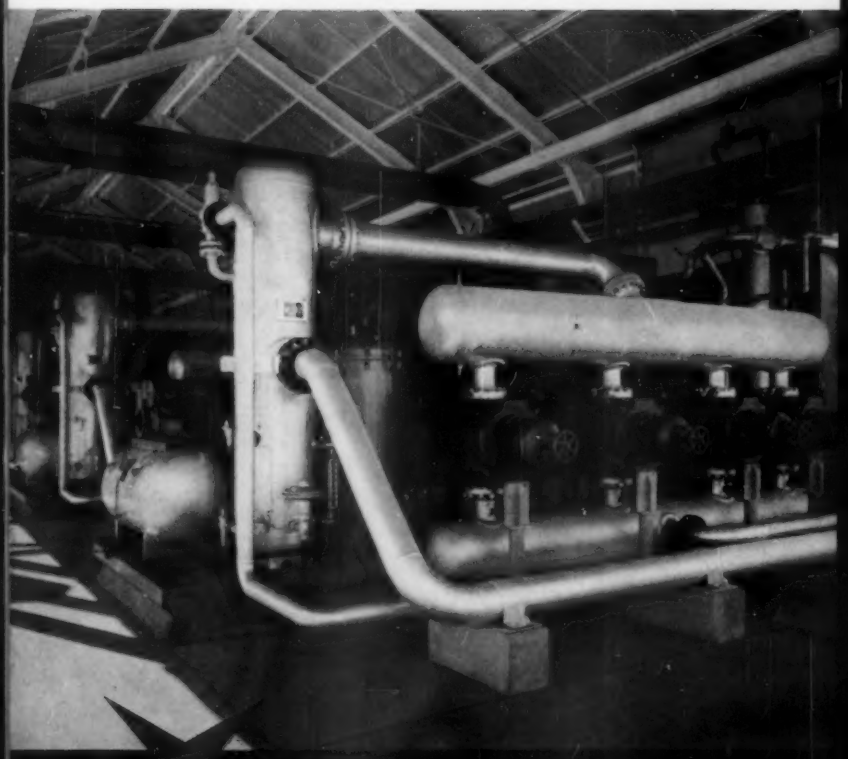
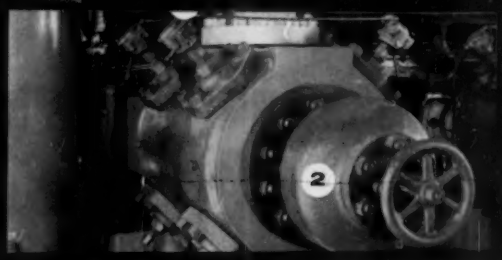
More Than Forty Years Of Leadership In Petroleum Refining Technology

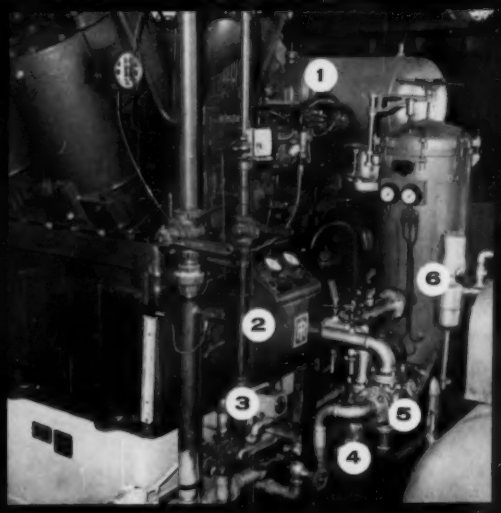


4-CYCLE DESIGN

INCREASED FLEXIBILITY FOR UNATTENDED STATIONS



COMPRESSOR CYLINDERS have (1) automatic inlet valve unloaders and (2) fixed volume clearance pockets. Valve unloaders are combined with automatic engine speed regulations to provide smooth loading and unloading while maintaining desired pressure conditions.



CONTROL CENTER with (1) AS&P controller (2) Engine gauge panel (3) Crankcase oil level valve (4) Three-way oil temperature control valve (5) Triflo four ported oil valve (6) Scrubber liquid level shutdown switch.

660 H.P. BEAIRD-INGERSOLL-RAND packaged compressors in an automatic, unattended gas boosting station. Units are equipped for unattended operation with speed and pressure regulation. Interstage and after cooling sections are mounted in the Young updraft design radiators. Other Beaird compressors available from 120 to 660 h.p.

Complex or partial control systems will not meet the requirements of a modern, automatically operated unattended compressor station. This is why leading operators select Beaird-Ingersoll-Rand 4-cycle packaged compressor for this service.

The 4-cycle design provides smooth power at any load (even with frequent variations), and at any engine speed from full to half. To meet even greater line variations compressor cylinders can be loaded or unloaded in steps from full to no load. Should conditions require the unit to stand by, the 4-cycle engine can be idled for long periods without carbon build up or damage to the valve ports. This is possible because the constant quality fuel mixing valve will handle all speed and load conditions.

Lowest cost per horsepower to install, Beaird-Ingersoll-Rand packaged compressors require minimum foundation and piping . . . can be easily moved to other service.

Beaird gas engineers are available to assist you with your plans on automatically operated field stations.

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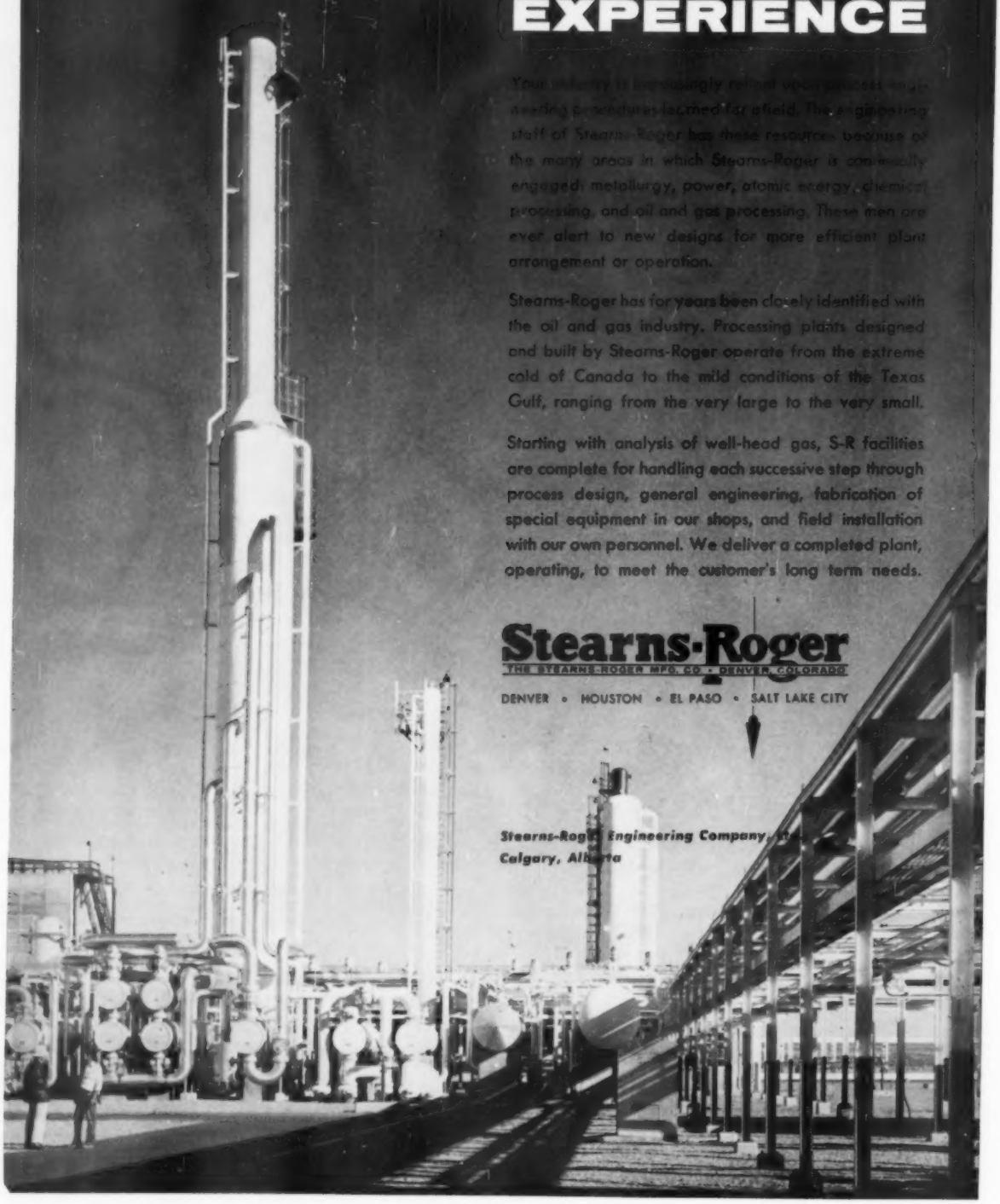

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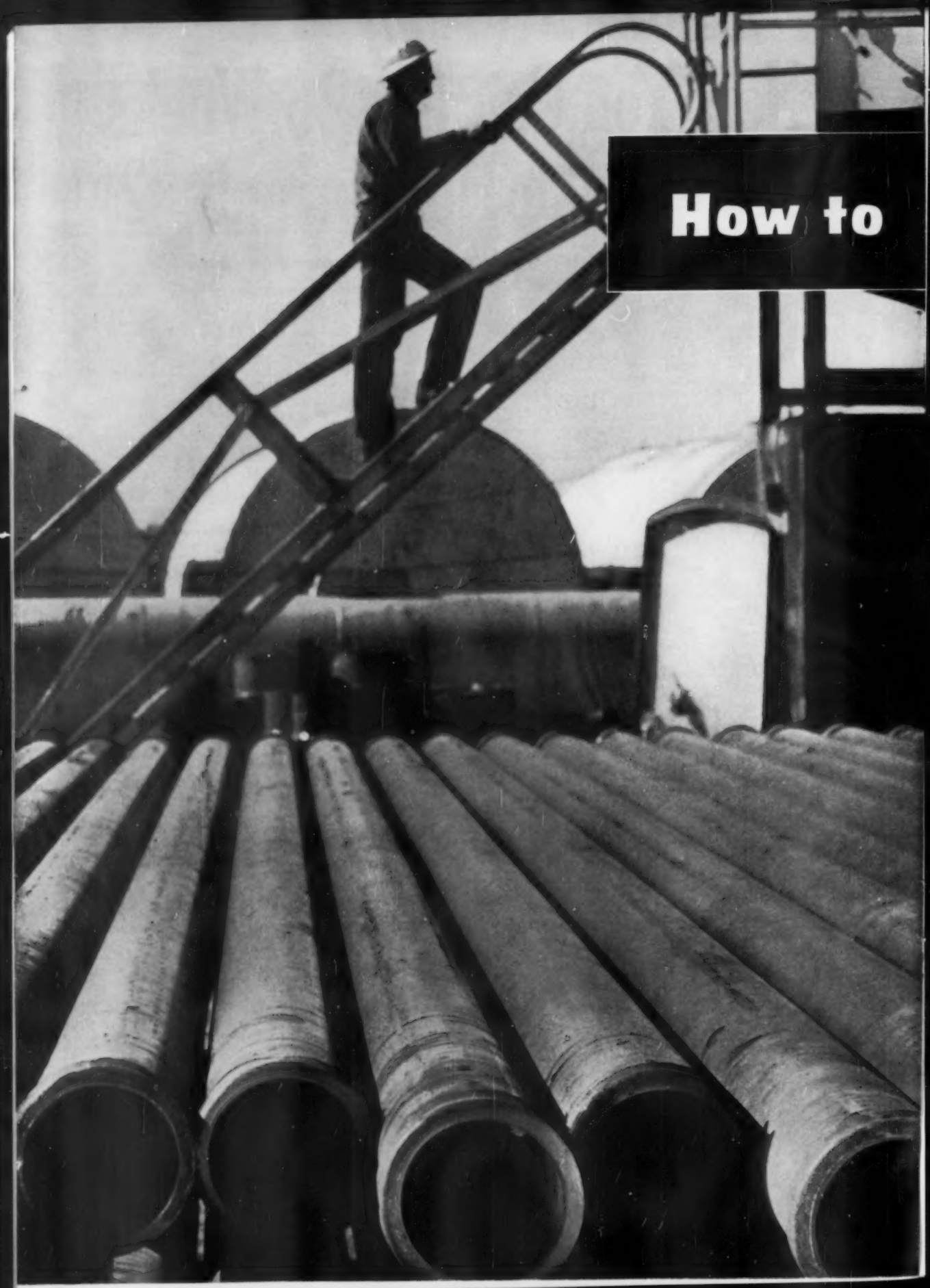
How to

Get Strength on the q. t.

Q and T— the quench and temper heat treatment process — plays an important part in the production of **J&L's High Strength Casing.**

Facilities for making quenched and tempered high strength tubular goods have been perfected by J&L. The process is automatic and the results uniform. After going through a high temperature furnace, the casing is water-spray quenched to build up yield and tensile properties. It is then tempered to make it tough and ductile.

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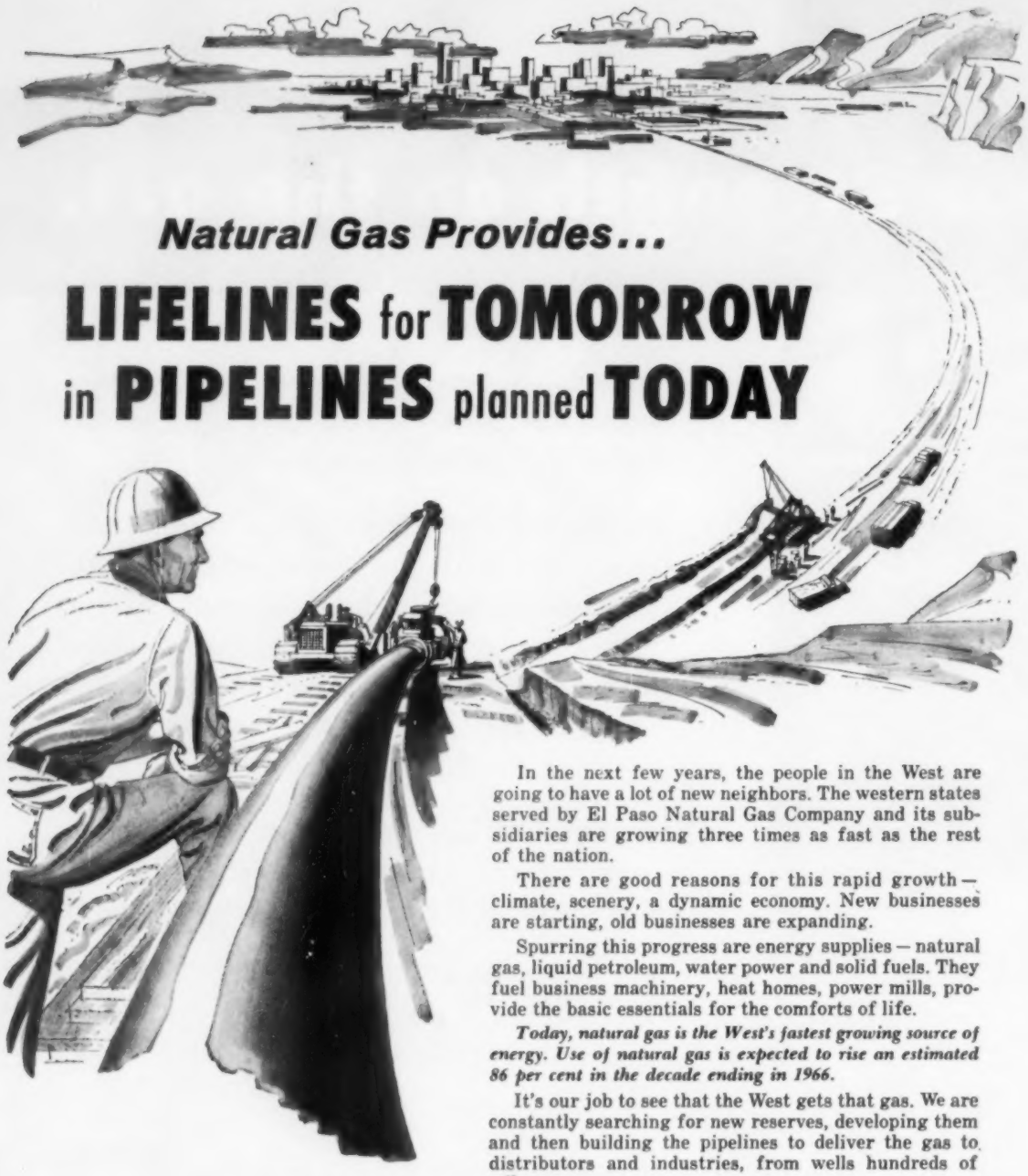
If it's sold by J&L....
It's the best available



Natural Gas Provides...

LIFELINES for TOMORROW in PIPELINES planned TODAY

In the next few years, the people in the West are going to have a lot of new neighbors. The western states served by El Paso Natural Gas Company and its subsidiaries are growing three times as fast as the rest of the nation.

There are good reasons for this rapid growth — climate, scenery, a dynamic economy. New businesses are starting, old businesses are expanding.

Spurring this progress are energy supplies — natural gas, liquid petroleum, water power and solid fuels. They fuel business machinery, heat homes, power mills, provide the basic essentials for the comforts of life.

Today, natural gas is the West's fastest growing source of energy. Use of natural gas is expected to rise an estimated 86 per cent in the decade ending in 1966.

It's our job to see that the West gets that gas. We are constantly searching for new reserves, developing them and then building the pipelines to deliver the gas to distributors and industries, from wells hundreds of miles away.

This effort pays off in the assurance that years in the future — even with demand growing at a record pace — the West will have the *energy supplies* essential for continued growth.

EL PASO NATURAL GAS COMPANY

Common Stock listed on the New York Stock Exchange, Midwest Stock Exchange and Pacific Coast Stock Exchange.

Registrars: *New York,* City Bank Farmers Trust Company; *Chicago,* The First National Bank of Chicago.

Transfer Agents: *New York,* The Chase Manhattan Bank; *Chicago,* Continental Illinois National Bank and Trust Company of Chicago.

They Say—

He favors tariff on imports

Dear Sir:

I want to endorse your editorial in the December 22 issue entitled "An Oil Tariff Is Better Than Regimenting the Industry." I have never been able to understand why "tariff" seems to be such a dirty word when used in connection with possible solutions to the oil import problem.

The federal Government has officially recognized the threat to defense inherent in unrestricted imports of foreign oil, and unless they propose to subordinate defense to the reciprocal-trade policy, there is no more straightforward, impartial means of achieving necessary restrictions.

These so-called voluntary programs and appeals to self-restraint have no more place in the solution to this problem than they have in the problem of restraining the rise of wages and prices and have been demonstrated to be completely ineffective in both cases.

What we need to do is unshackle the forces of supply and demand, imposing, in the case of imports, a tariff sufficient only to guarantee the ability of the domestic industry to meet all defense needs.

Under a tariff, crude oil from all over the world would find its proper place in the market, and the program would be administered by existing agencies under familiar rules and with predictable results.

It might even have a desirable effect on some countries which seem to think they can expropriate, abrogate, and confiscate property of U. S. nationals without endangering the guaranteed, protected market we maintain for them.

Giles A. Penick, Jr.
Attorney
Tulsa.

What's cat-cracker record?

Dear Sir:

There's an argument at the refinery here as to who holds the record for continuous operation of a cat cracker. I seem to remember reading in the Journal that one company had set a record of more than 1,000 days without a turnaround.

Can you tell us what the record is and who holds it?

Joe Wallace
Philadelphia

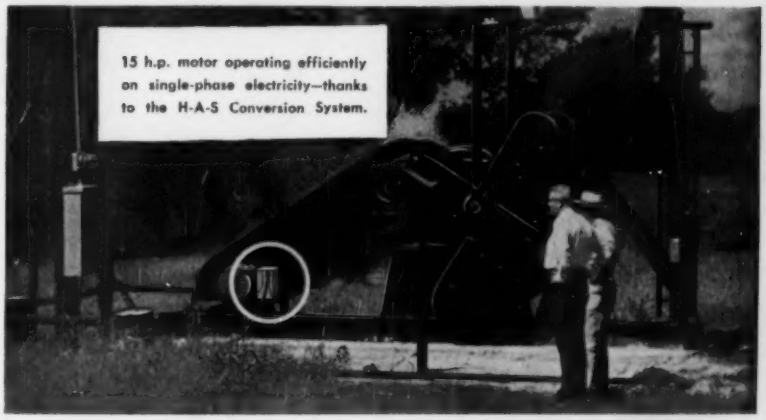
(Editor's note: Record claim on hand at the Journal belongs to Cities Service Oil Co.'s Lake Charles, La., refinery. A cat cracker there operated 1,065 days without turnaround—from April 9, 1954, to March 10, 1957 (OGJ, May 6, 1957, p. 108). The unit processed 46,683,438 bbl. of feed stock during this period. No other prospective record holders have come to our attention since that time. Does anyone know of a longer period of continuous operation?)

Standardized symbols, please

Dear Sir:

We have noted with interest the article "What You Ought to Know About Process Flow Sheets" by D. J. Oriolo in the November 17 issue of The Oil and Gas Journal (p. 151).

This is a good article and we were particularly pleased to see the author's reference to the Instrument Society



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"How to use three-phase motors on SINGLE-PHASE CURRENT"

. . . and profit from the added economy and efficiency!

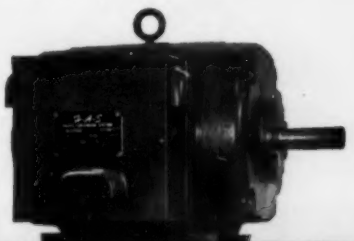
Three-phase motors cost less than single-phase motors, are more efficient and have far greater salvage value.

The New H-A-S Phase Conversion System enables you to use three-phase motors (3 h.p. or larger) on 220 V single-phase current. Three-phase motors cost less, operate for less, and can be used later on three-phase current.

The H-A-S is available in two models, for motor mounting and remote mounting.

On many rural single-phase lines service is limited to 5 h.p. single-phase motors, but the H-A-S Phase Conversion System permits the use of three-phase motors up to 75 h.p.

This is GOOD NEWS in the oil country. To solve an immediate problem—or for your files—write NOW for complete details and the name of your nearest supply store or distributor!



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H-A-S PHASE CONVERSION SYSTEM

JELFLAKE

lost circulation insurance in a 25 lb. bag

Jelflake®, the Dowell-developed material for preventing lost circulation, has saved many hours of costly rig time. Get a supply of Jelflake *before* you drill into questionable zones. Then condition your mud as you drill. The fragmented plastic foil bits are designed to seal off the thief zones—saving mud money and rig time.

Jelflake has other advantages too. It is easy to use. It is inexpensive. 25 pounds goes a long way. It has proved effective in preventing slurry loss during cementing operations. It will not plug mud-pump valves.

Try Jelflake. It's low-cost insurance where mud money counts. Jelflake is available in strong, wet-proof bags at major mud distributors and through all 165 Dowell offices and service points. In Canada, call Dowell of Canada, Ltd.; in Venezuela, United Oilwell Service. Dowell, Tulsa 1, Oklahoma.

Products for the oil industry — DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

of America's Flow Plan Symbol identification.

This work of the ISA's has done much to bridge the gap in the transmission of information between companies and individuals. I would like to ask that The Oil and Gas Journal do what it can to standardize on ISA's symbols in the many flow diagrams that appear in your magazine.

Glen G. Gallagher
Fluor Corp., Ltd.
ISA Vice President
Standards and Practices Dept.

How privileged can you get?

"The oil industry has been a favorite whipping boy for the 'liberals' in Congress. Has it been a privileged class, taxwise? The answer is 'No.'

"The Treasury Department and Internal Revenue Service reveal the following figures: The United States Government in 1957 received from special federal petroleum taxes: Gasoline, $1,625,532,000; diesel oil, $45,050,000; lubricating oil, $73,835,000; pipelines, $35,481,000.

"It's hard to argue around these figures."

Editorial in the Tulsa Daily World.

Jersey views 1959 problems

"The oil industry in 1959 faces new problems. One of the most serious arises from a decision of Venezuela's provisional government which on December 20 raised taxes very drastically on a retroactive basis to the first of 1958.

"The industry has urged that an opportunity be afforded to discuss the matter thoroughly with the Venezuelan authorites.

"Among other oil industry problems may be moves here at home to increase the tax burden on our industry even though this would hamper the search for continuing supplies of new oil, and attempts to increase gasoline taxes still further even though gasoline is already one of the most heavily taxed of all commodities."

Eugene Holman, chairman of the board, Standard Oil Co. (N. J.), in a year-end statement.

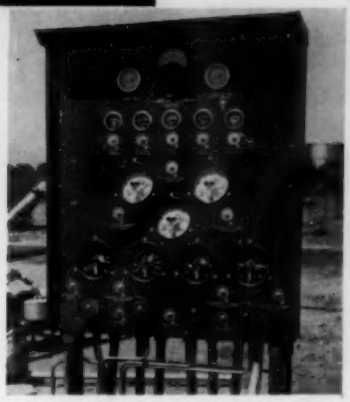
Gas-tax money misused

"Newspapers report that Washington is considering another increase in federal taxes on motor gasolines, which would add 1 to 2 cents more per gallon on top of the present 3 cents per gallon federal tax.

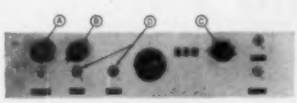
"The excuse for the big increase is to get the Federal Highway Trust Fund out of a 'deficit' now revealed as anticipated for 1960 and 1961.

MURPHY

MODULAR PANELS CENTRALIZE ENGINE, OR MOTOR AND COMPRESSOR SAFETY AND CONTROL!

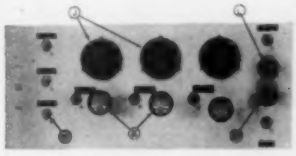


A Fillmore, California Installation



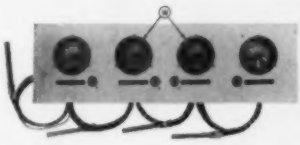
ENGINE CONTROL PANEL

Murphy Engine Safety Switches provide visible indication as well as positive shutdown in the event of trouble. A typical panel is equipped with (A) water temperature (SR-21), (B) oil pressure (0-75), (C) overspeed and overload (V-230), safety switches. In addition, individual Murphy "Tattletale" Switches (D) are installed to give indication of the cause of shutdown.



COMPRESSOR CONTROL PANEL

Complete compressor protection is afforded each function of your valuable equipment by this modular panel consisting of the following standard Murphy safety switches: (J) OPL-F Hi-Lo Pressure Switches complete with (K) pulsation dampeners for suction, interstage and discharge pressures; (L) one compressor water jacket temperature (SR-21), (M) one compressor oil pressure (0-75), (N) one compressor oil level (L-100-W), and individual "Tattletale" Switches to show cause of shutdown. Saves valuable time in trouble-shooting.



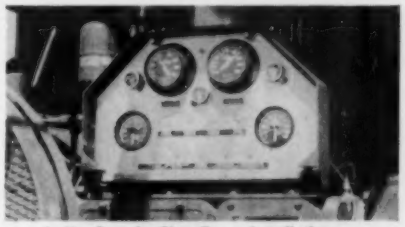
COMPRESSOR TEMPERATURE CONTROL PANEL

These Murphy SPL Hi-Lo Temperature Safety Switches (W) will provide your compressor with precise temperature indication and protection throughout the system. Compressor operating conditions are most readily indicated by line temperatures and Murphy SPL units protect against excessive temperatures. Stainless steel seperable sockets permit easy installation.

Murphy "Tattletale" Switches pinpoint trouble automatically. SPL switches are available in these standard ranges: 100°-350°F, 260°-450°F, 30°-300°F. Other ranges on request.

Only Murphy Safety Switch offers complete compressor instrumentation providing indicating gauges with positive shutdown protection in standard or semi-standard panels with prices that S-T-R-E-T-C-H your equipment dollar.

Engine or electric-motor powered, your compressor can be Murphy-equipped through local dealer stocks of standard components or contact our Engineering Department for complete details.



A Rio Grande City, Texas Installation

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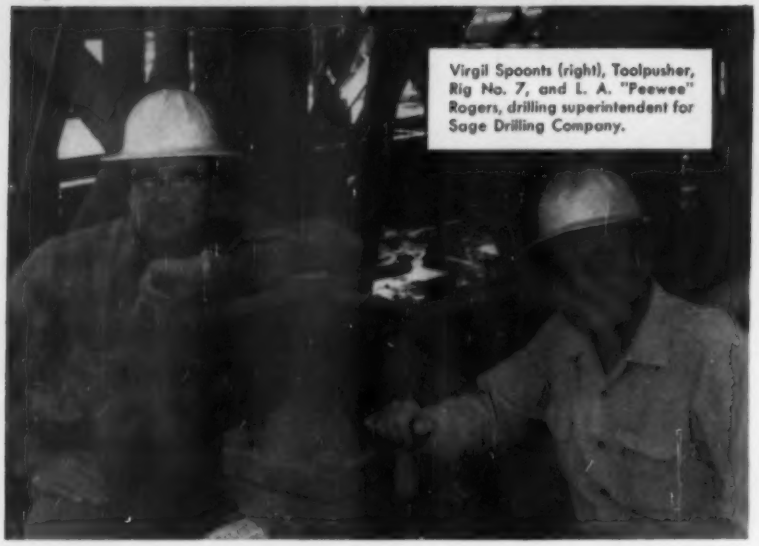
FRANK W. MURPHY Manufacturer, Inc.
RANCH ACRES STATION TULSA, OKLAHOMA

Tips on Mud Valves for Toolpushers...



Virgil Spoonts (right), Toolpusher, Rig No. 7, and L. A. "Peewee" Rogers, drilling superintendent for Sage Drilling Company.

Our Mudwonder Valves just *don't* sand up!

by Virgil Spoonts, Toolpusher, Rig #7
Sage Drilling Company, Blanding, Utah

"I'VE used a lot of different mud valves in 10 years of toolpushing. Used to be, I'd have to baby them along . . . operate the standpipe valve every day or so to keep 'em flushed out. If I didn't, they'd sand up so bad I'd need a 36-inch wrench to close them.

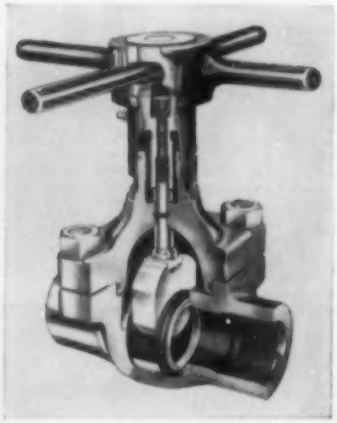
"But not with Mudwonders. I've never had one jam up with sand in the seat. As soon as I bring the gate down close, the flow sluices all sand out of the way. I close 'em hand-tight and they hold. Never need a wrench.

"We rigged up new with Mudwonders on Number Seven. 17 two-inchers and 4 of the four-inch size. Since we started drilling, in August, 1957, we've had to repair only one of them. It was used on jet and hadn't been properly closed. But it's real easy to put in a new insert—or even a gate—without disturbing any connections.

"Lack of downtime is mighty important to us. We've had *no* lost time due to Mudwonders, except the ten minutes it took to repair the one I mentioned. Parts are no problem, either. We just keep a couple of seat inserts and an extra gate on hand for each size—how's *that* for inventory control?"

Mudwonder valves are built in 2", 3" and 4" sizes; with screw or flange ends; for 2000 psi WP (4000 psi test) and 3000 psi WP (6000 psi test) service. See your favorite oil field supply store, or write Edward Valves, Inc., East Chicago, Indiana, subsidiary of Rockwell Manufacturing Company.

Mudwonder cut-away view shows the one-piece seat insert, with Buna-N molded integrally over steel wear rings; chromed gate with "T" slot connection; separated stainless stem and double thread construction.



People who already bear the extremely heavy burden of special gasoline taxes at both federal and state levels, now averaging 9 cents a gallon, purportedly are to be loaded with an additional burden.

"Last year the Government collected some $3,600,000,000 in gasoline and other automotive taxes and of this, only $2,100,000,000 found its way into the Federal Highway Trust Fund. But the other $1.500,-000,000 was spent for something else than the highways.

"The so-called 'deficit' is anticipated in Washington only because in Washington over ⅓ of the special automotive taxes collected last year were not used for the highway program but were diverted to general funds for other purposes.

"A gasoline tax should not be expected to correct a national deficit in general funds. . . The solution would seem to lie in the proper use of the present automotive tax collections and not in the imposition of an additional tax."

Clyde T. Foster, chairman of the board, Standard Oil Co. (Ohio), in a letter to President Eisenhower.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

JANUARY

12-14 Pipe Line Contractors Association, eleventh annual convention, Americana Hotel, Miami Beach, Fla.

12-16 Society of Automotive Engineers, annual meeting and engineering display, Sheraton-Cadillac and Statler hotels, Detroit.

16-17 Association of Oilwell Servicing Contractors, annual meeting, Baker Hotel, Dallas.

21-22 Western Petroleum Refiners Association, Gulf Coast regional technical-industrial relations meeting, Ben Milam Hotel, Houston.

22-23 National Association of Corrosion Engineers, Houston section, annual short course, University of Houston campus, Houston.

22-23 American Chemical Society, Southeastern Texas section, third biennial symposium on hydrocarbon chemistry, Shamrock Hilton Hotel, Houston.

22-24 Texas Society of Professional Engineers, annual convention, Shamrock Hilton Hotel, Houston.

23 Natural Gasoline Association of America, Oklahoma regional meeting, Biltmore Hotel, Oklahoma City.

26-29 Tenth annual plant maintenance and engineering conference, sponsored by Clapp & Poliak, Inc., Public Auditorium, Cleveland.

28-29 Annual Midwest Welding conference, sponsored by Armour Research Foundation of Illinois Institute of Technology, and American Welding

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OIL SUCTION AND DISCHARGE HOSE LIKE THIS!

CRUSHPROOF... LEAKPROOF... FLEXIBLE FOR VOLATILES AND GASES

Pioneered and performance-proved for more than one-quarter of a century by Penflex there has never been a suction and discharge hose like this for long service and trouble-free conveying of volatiles and gases.

This Penflex O. S. & D. Hose stands pressures to 600 psi . . . is stainless steel lined for rugged flexibility . . . covered with tough rubber for leakproof security. It is lighter in weight than any other comparable competitive hose . . . easy to handle with swivel flange that allows installation in any position without turning entire hose to meet bolt holes. End fittings are made of steel to meet specifications of refinery engineers.

Penflex Suction and Discharge Hose is used by leading industries throughout the nation for all-purpose duty. It is the proved and approved all-purpose hose for oil, gasoline, solvents, corrosive chemicals and other volatiles and liquids. Available in sizes 2" to 12" I.D. in galvanized steel, stainless steel and bronze pressure carrier. Write for technical data sheet.

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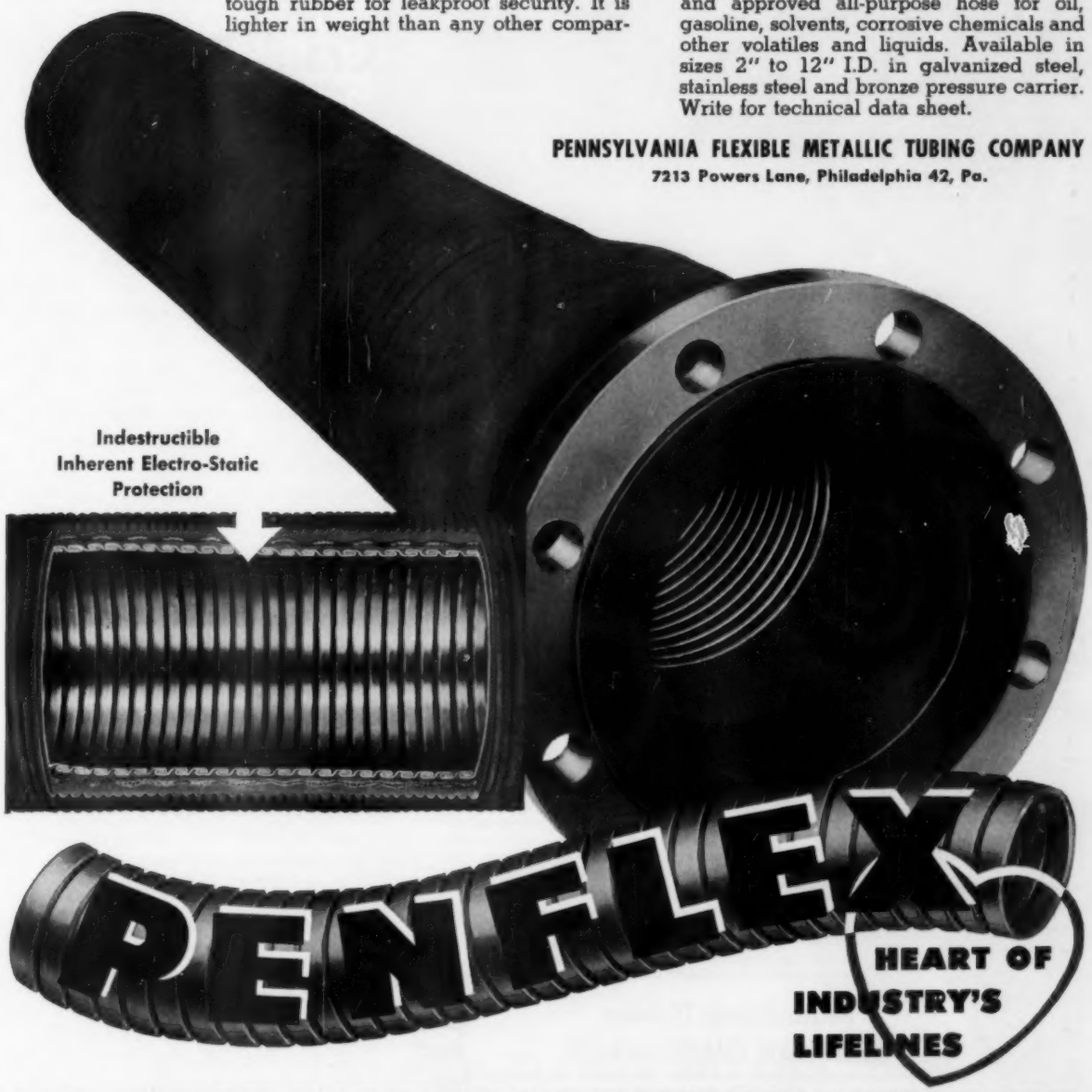
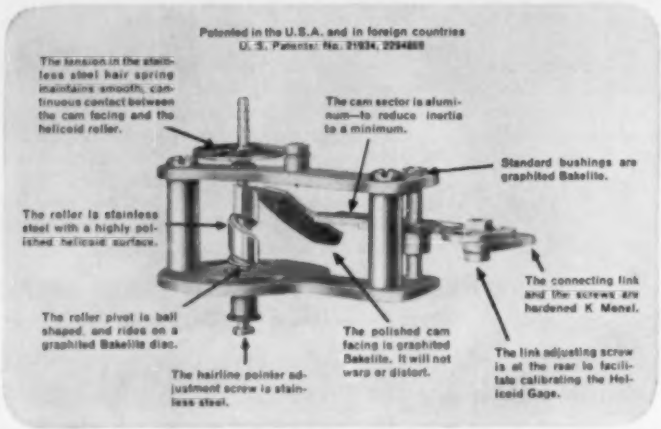
7213 Powers Lane, Philadelphia 42, Pa.



THE ORIGINAL ALL-METAL, PLUS RUBBER OIL SUCTION AND DISCHARGE HOSE PIONEERED BY PENFLEX

Nothing but the best in gages for working pressures from 30" vacuum to 10,000 p.s.i.

These details of Helicoid gage design assure longer life and enduring accuracy


Patented in the U.S.A. and in foreign countries
U. S. Patents: No. 21934, 2294888
The tension in the stainless steel hair spring maintains smooth, continuous contact between the cam facing and the helicoid roller.
The cam sector is aluminum—to reduce inertia to a minimum.
Standard bushings are graphited Bakelite.
The roller is stainless steel with a highly polished helicoid surface.
The connecting link and the screws are hardened K Monel.
The roller pivot is ball shaped, and rides on a graphited Bakelite disc.
The polished cam facing is graphited Bakelite. It will not warp or distort.
The link adjusting screw is at the rear to facilitate calibrating the Helicoid Gage.
The hairline pointer adjustment screw is stainless steel.

The superiority of Helicoid Gages is most evident in severe service—wherever a gage is subjected to violent pressure pulsations or severe mechanical vibrations.

The *sustained accuracy* of Helicoid Gages over *millions of cycles* is explained by the details of design and construction of the Helicoid movement shown above. Such Helicoid features—protect against wear and corrosion and assure sensitivity, sustained accuracy and trouble-free operation.

The Chemical Gage

The Helicoid Chemical Gage has a guaranteed accuracy of plus or minus 1%. It is applicable for working pressures from 30" vacuum to 5000 p.s.i. and temperatures to 400° F. It is particularly suitable for chemicals and other viscous fluids which might clog or corrode a Bourdon tube. Pressure and/or vacuum is transmitted directly to the indicating gage element through deflection of a Teflon or Kel F sealing diaphragm.

Tubes built for millions of pressure pulsations

To fit the wide range of applications, Helicoid Bourdon tubes are available in four materials—alloy steel, K Monel, stainless steel and phosphor bronze.

All Helicoid tubes are made from seamless tubing and are carefully designed to give maximum torque and minimum stress. When used within the dial range, they will withstand many millions of pressure pulsations and will not stretch, leak or crack.

For complete information on the Helicoid line of gages write for **Catalog G-52**

Helicoid gives you all these features at prices that are competitive in the quality gage field.

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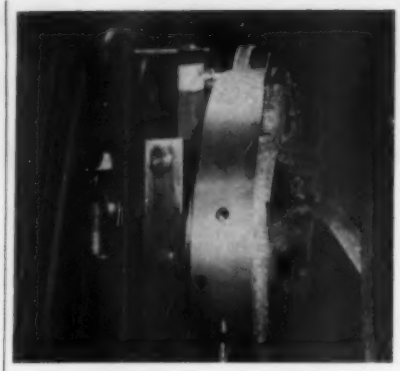

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● Accurate High Quality Maintenance And Machine Work

The small engine crank pictured above was restored in close quarters without dismantling engine. Our portable machines can solve your problems and save you money. Crank pins from 5½" through 20" in diameter accurately refinished in place at great saving in cost. Let us help you minimize down time.

Worn and damaged flywheel fits refinished in place.

In our shop crankshafts of any size or type completely refinished. Shafts straightened and broken shafts successfully repaired.

Most modern methods used in rebabbitting and machining engine and turbine bearings.

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Additional information furnished without obligation.

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Established 1876

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Society, Chicago section, Illinois Institute of Technology, Chicago.

30-31 Oklahoma Society of Professional Engineers, annual meeting, Mayo Hotel, Tulsa.

FEBRUARY

1-4 American Association of Petroleum Geologists, Rocky Mountain section, ninth annual meeting, Civic Auditorium, Albuquerque, N. M.

1-6 American Society for Testing Materials, D-2 committee on petroleum products and lubricants, Sheraton-Jefferson Hotel, St. Louis.

2-22 Southwestern Legal Foundation, course on oil and gas law, Southwestern Legal Center, Dallas.

11-13 Southwestern Legal Foundation, tenth annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

11-13 National Association of Corrosion Engineers, Tulsa section, tenth annual pipeline corrosion short course, Mayo Hotel, Tulsa.

15-19 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Sir Francis Drake Hotel, San Francisco.

16-18 American Management Association, seminar on management problems of exploration and production, Hotel Astor, New York.

24-25 University of Oklahoma, sixth geological symposium, Norman, Okla.

27 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

26-28 Pipe Line Contractors Association of Canada, fifth annual convention, Castle Harbour Hotel, Bermuda.

MARCH

3 Petroleum Equipment Suppliers Association, Pacific district, annual membership meeting, Ambassador Hotel, Los Angeles.

9-11 Midwest Gas Association, annual meeting, Hotel Fort Des Moines, Des Moines.

11 Petroleum Equipment Suppliers Association, southwestern district, annual membership meeting, Shamrock Hilton Hotel, Houston.

13 American Institute of Chemical Engineers, Sabine area section; American Chemical Society, Texas-Louisiana Gulf section; sixth annual joint technical meeting, Lamar State College of Technology, Beaumont, Tex.

16-18 Western Petroleum Refiners Association, forty-seventh annual meeting, Hilton Hotel, San Antonio, Tex.

17-18 Manufacturing Chemists' Association, air and water-pollution abatement conference, Netherlands Hilton Hotel, Cincinnati.

18 Petroleum Equipment Suppliers Association, eastern district, annual membership meeting, Duquesne Club, Pittsburgh.

16-19 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, forty-fourth annual meeting, Memorial Auditorium, Dallas.

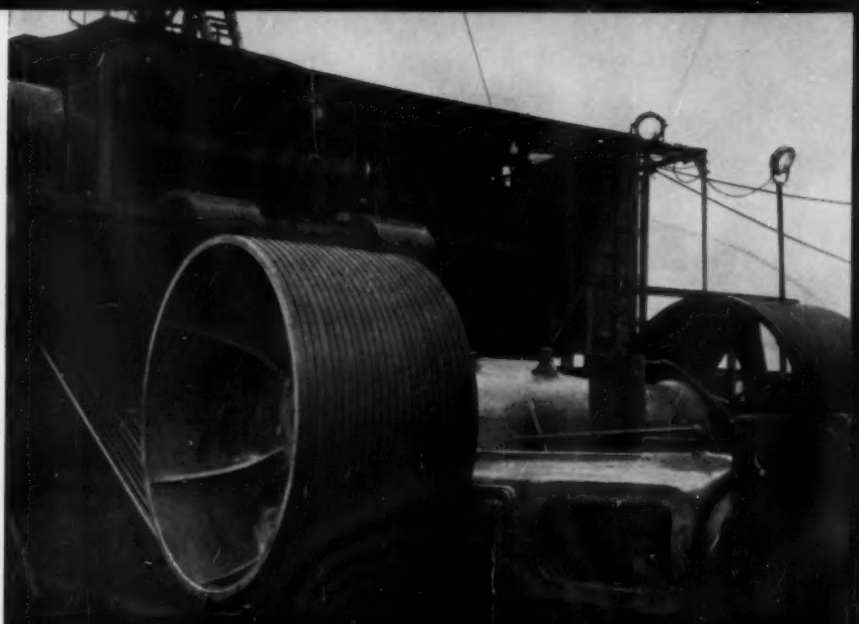
19-20 New England Gas Association, annual meeting, Hotel Statler, Boston.

25-27 American Petroleum Institute, Division of Production, southern district meeting, Roosevelt Hotel, New Orleans.

APRIL

2-3 Society of Petroleum Engineers of AIME, Rocky Mountain petroleum section, Casper, Wyo.

2-3 American Institute of Mining, Met-



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POWERFLEX
MULTI-V BELTS

On rigs, compressors and pumps, these *premium* heavy-duty belts stay "on-the-job" longer and provide maximum power transmission. You save time and money because belt wear *and* resultant belt changes are reduced to a minimum.

Pre-stretched to assure long-lasting dimensional stability, Thermoid *Powerflex* Multi-V Belts have the strength and flexibility to absorb the repeated shock loads of heavy-duty oil field service. *And* when you replace with Thermoid *Powerflex* "matched sets", the load on the belts is equalized—fresh replacement belts are *not* left pulling the load for "lazy" old belts. Belt replacement is one *fast* operation. Downtime and maintenance costs are cut to the bone.

Order Thermoid Powerflex Multi-V Belts and Thermoid Brake Blocks and Hose for all oil field applications from your supply store or nearest Thermoid Warehouse.

For rugged oil field service, always specify Thermoid Brake Blocks.

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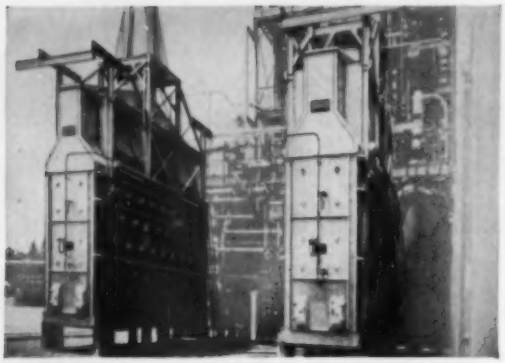
THERMOID DIVISION

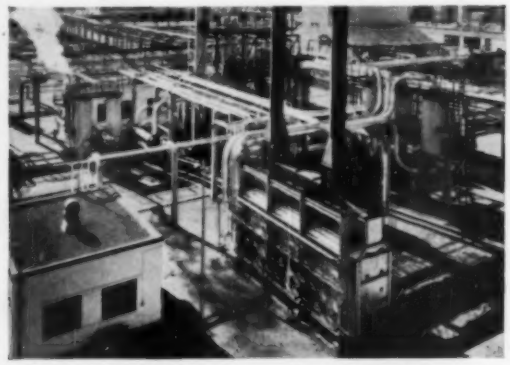
SELAS

HORIZONTAL GRADIATION® FURNACES

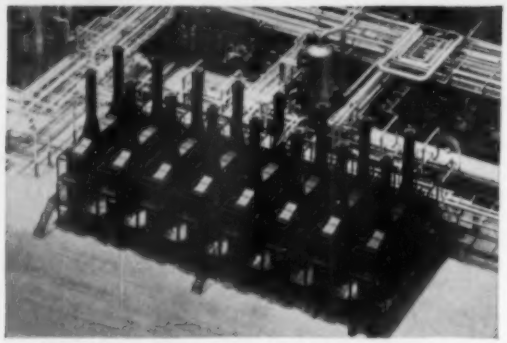
are in service wherever critical heat processing is required throughout the petroleum, petrochemical and chemical industries. The installations shown below demonstrate the benefits of Gradiation heating:



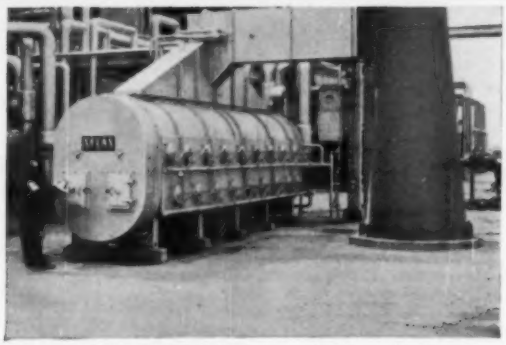
PRECISENESS OF HEATING . . . is essential in the continuous production of Carbon Bisulfide to assure that tube wall temperature is uniform throughout the entire radiant section.



ZONE CONTROL and INSTANT RESPONSE TO CONTROLLER DEMAND . . . permit the use of three independent coils in a single heater in this Catalytic Reforming operation.



ABILITY TO HANDLE A VARIETY OF FEED STOCKS IN ONE HEATER . . . each individual heater in this Ethylene installation is capable of handling ethane, propane, butane or naphtha, interchangeably, under optimum conditions.



LOW EQUIPMENT COST . . . simple and compact, this two-control zone shop-assembled Gradiation heater is the most economical furnace for many kinds of heating service.

For information about Gradiation tubular heaters send for Bulletin 81 "Gradiation Heating for Petroleum and Chemical Processing." Selas engineers will be glad to discuss with you your specific heat processing requirements.

Gradiation is a registered trade name of Selas Corporation of America.

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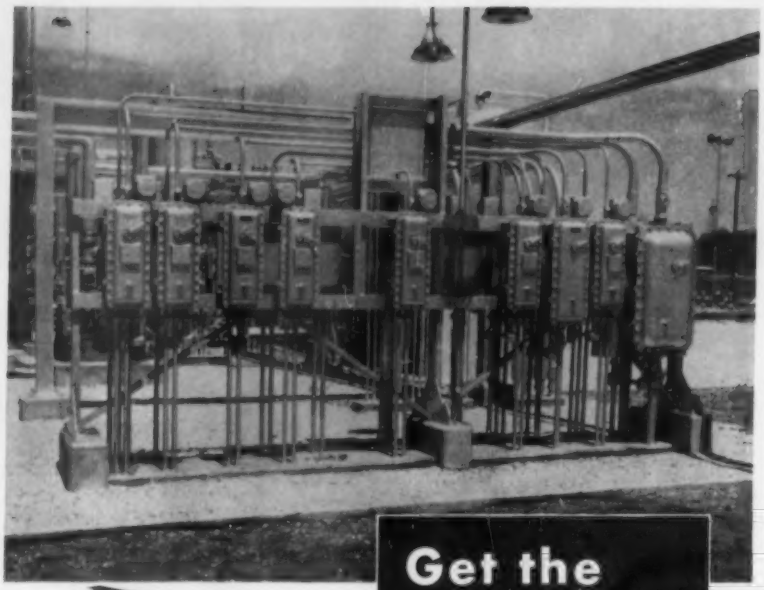
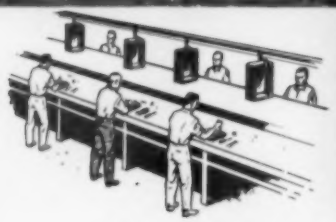
Heat and Fluid Processing Engineers

DEVELOPMENT • DESIGN • CONSTRUCTION





Get the economies of factory assembly

. . . plus satisfaction of field personnel by using Nelson Switchracks

Centralized motor control is the modern trend. In the above photo you see a Nelson switchrack with various components including control switches to motors driving the processing pumps in a fractionating plant of Warren Petroleum Corporation.

For outdoor installations Nelson switchracks provide ease of installation and all the advantages of factory assembly and wiring. One purchase order, one receiving report, yet you receive a complete unit. At Nelson each switchrack is specially designed to give the customer the ultimate in performance.

Nelson switchracks are available in either single front or double front, and with or without canopies for weather protection. Components can either be explosion-proof (NEMA 7), watertight and dust-tight (NEMA 4 & 5) or oil immersed (NEMA 8). If you have no preference for arrangement Nelson engineers will design to give you maximum utility in minimum space.

For more complete information write for Bulletin 497

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TULSA, OKLAHOMA

allurgical, and Petroleum Engineers, technical conference on stress corrosion, Mellon Institute, Pittsburgh.

6-7 Instrument Society of America, second national symposium on chemical and petroleum instrumentation, St. Louis.

5-10 American Society of Mechanical Engineers, nuclear congress, Cleveland Auditorium, Cleveland.

8-10 American Petroleum Institute, Division of Production, eastern district meeting, Penn-Sheraton Hotel, Pittsburgh.

14 Independent Oil Men's Association of New England, annual meeting, Hotel Statler, Boston.

14-16 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.

15-17 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

15-17 American Petroleum Institute, Division of Transportation, annual tanker conference, Jung Hotel, New Orleans.

16-17 Rocky Mountain Oil and Gas Association, midyear meeting, Casper, Wyo.

19-23 American Society of Mechanical Engineers, oil and gas power conference and exhibit, Shamrock-Hilton Hotel, Houston.

22-24 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Herring Hotel, Amarillo, Tex.

22-24 Natural Gasoline Association of America, thirty-eighth annual convention, Baker and Adolphus Hotels, Dallas.

26-28 Texas Independent Producers and Royalty Owners Association, membership meeting, Baker Hotel, Dallas.

29-30 Western Petroleum Refiners Association, Southwest regional technical-industrial relations meeting, Hotel Paso del Norte, El Paso.

30-May 1 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

MAY

1 Fourth annual petroleum accounting conference, sponsored by Wichita chapters of the Petroleum Accountants' Society of Kansas, National Association of Accountants, the Kansas Society of Certified Public Accountants, and the University of Wichita; Lassen Hotel and University of Wichita campus, Wichita.

3-6 Liquefied Petroleum Gas Association, twenty-eighth annual meeting and trade show, Conrad Hilton Hotel, Chicago.

4-7 American Geophysical Union, annual meeting, Washington.

5-7 Purdue University, fourteenth Purdue industrial-waste conference, Purdue Memorial Union Building, Lafayette, Ind.

6-8 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone, Henning, and Townsend hotels, Casper, Wyo.

7-8 Society of Petroleum Engineers of AIME, Permian Basin section oil recovery conference, Midland, Tex.

13-15 American Petroleum Institute, Division of Transportation, annual pipeline conference.

25-27 Chemical Institute of Canada, forty-second annual conference, Halifax, N. S.

COMPACT CHRISTMAS TREES for Lake Maracaibo

Boat traffic and tropical storms present a real problem in the forest of flowing oil wells on Lake Maracaibo. Collisions with well heads are a constant threat to safety and production. In cooperation with Cia. Shell de Venezuela, Cameron has designed and built compact trees of the unusual type shown above to combat this problem. As an extra benefit this design is only one-fifth the size of conventional trees with the same rating but provides higher production. Flow lines are set close to the casing, and a steel jacket protects the entire assembly. Solving problems in pressure control is our specialty. Oil, gas, mud, steam, chemicals, atomic reactors, jet engines, guided missiles—our experience is varied and vast. That's why you can COUNT ON CAMERON for safety and profits when pressure is a problem.

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Orbit Cast Steel Drilling Valves (non-rising stem) are available in sizes: 5", 6", 8", and 10", 500 lbs., 1000 lbs., 1500 lbs., 2000 lbs., and 3000 lbs. WOG, Screw Ends. 720 lbs., 960 lbs., 2000 lbs., and 3000 lbs. WOG, Flanged Ends. Full Round Opening.

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Write for Catalog 58-A covering Production Valves, Catalog 58-B covering ASA Class Valves.

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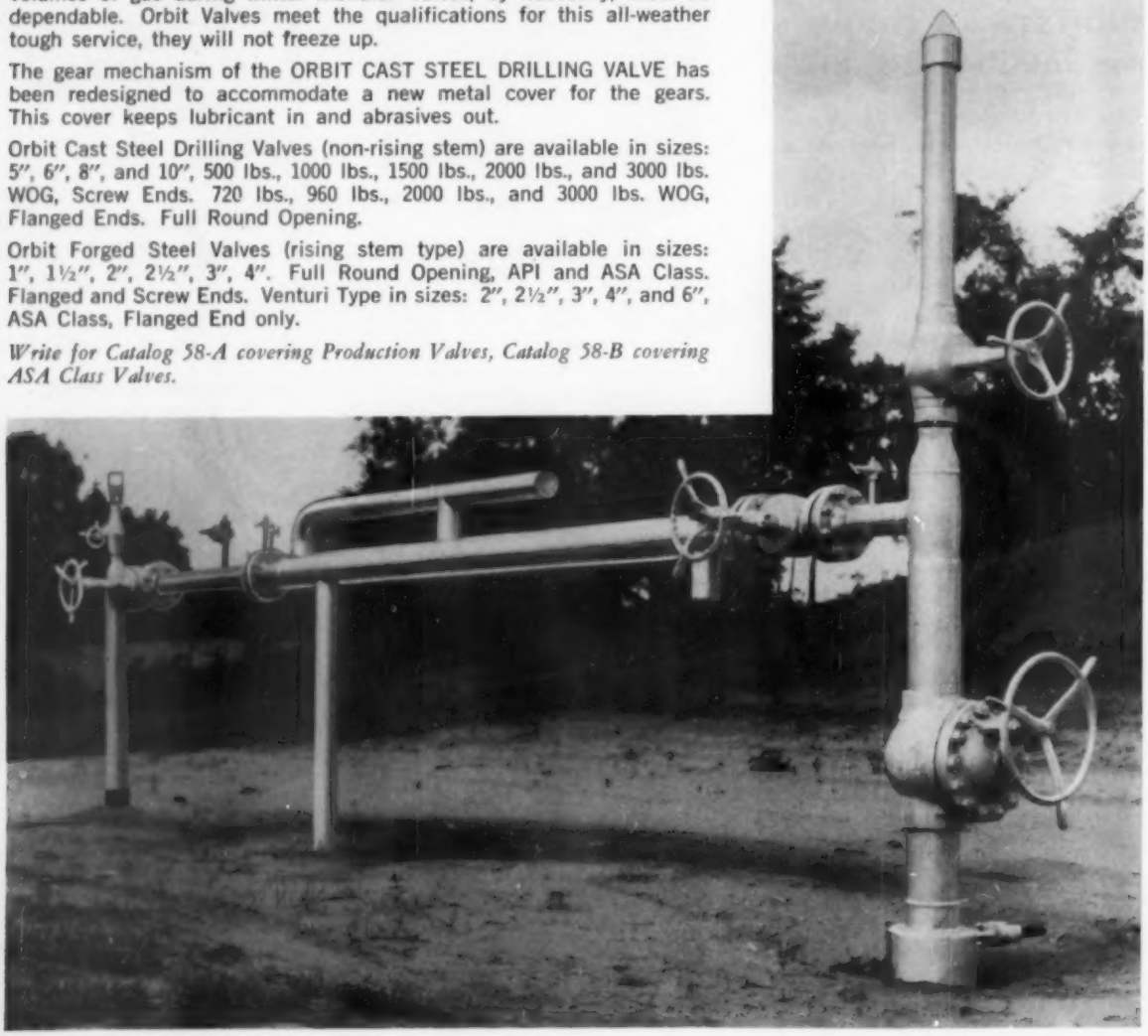
This Gas Storage Well is located 10 miles west of Big Rapids, Michigan.



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TULSA, OKLAHOMA

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JOURNALLY SPEAKING

Story Gets Reporter

OSCAR should have been a newspaper reporter—the Hollywood type of police reporter who's always having harrowing escapades. Or maybe a writer of adventure stories. Or a character in one of O. Henry's hilarious yarns about Central American soldiers of fortune.

Talk about news coming to a reporter! We never knew anyone with as much luck in just happening to be on the spot when something exciting occurred.

We're talking about Dr. Oscar B. Irizarry, the Journal's expert on Latin-American oil. You'll find his by-line over a big piece in the news section this week, so you might be interested in knowing more about him.

You don't see his name in the Journal very often because his real job is being editor of Petroleo Interamericano, our sister publication issued monthly in both Spanish and English and circulated exclusively outside of this country.

Oscar just got back from a 3-month trip through all the palm-fringed oil lands south of the border, and the significant things he ran into are in his article.

But what he left out was more interesting.

Dr. Irizarry (rhymes with "very sorry") was born in Puerto Rico. He got his first name from a Scots grandfather and his last name from a Spanish father. This makes him half Scotch and half soda and, like that drink, his effervescence frequently masks his potency.

Consider this recent trip. His plane landed at the Havana airport just as the Cuban rebels stormed it and set fire to the terminal building in the climax of the revolution that deposed President Batista. We know 700 news reporters who would have given their eyeteeth for such a chance at on-the-spot reporting. But Oscar was after nothing but oil news.

In Bogotá, Colombia, he was visiting the Ministry of Mines when a big department store across the street burned down, taking the lives of some 90 people.

In Buenos Aires he paid for a pair of fine alligator shoes from a big store on the main boulevard and arranged to pick them up the next day. That night the Argentines rioted against high prices and wrecked some of the best stores in town. We don't need to tell you that that shoe store and Oscar's shoes were a total loss.

All the way down the East Coast of South America and back up the West Coast, Oscar was accompanied by unseasonal and terrific rains, storms, and floods. At one place his taxi ran out of gas miles out in the country. At another place he had an appointment to visit a refinery but just before he got there a boiler exploded and his visit was canceled.

That was just this one trip. On other visits to the South he has been bitten by a scorpion; seen the car containing his baggage roll off a 1,000-ft. cliff; survived earthquakes, hurricanes, and riots; been detained for questioning by police or customs officials; and had his pocket picked of money, passport, and identification papers. (He now carries everything in a big leather case chained to his belt.)

Last year, of course, he was in Caracas just when the Venezuelans gave the heave-ho to Dictator Perez Jiminez, and Oscar got a bit roughed up and trampled on by the mobs rushing through the streets.

And practically every time he flies in South America his plane just barely avoids hitting the top of the Andes, losing an engine over the jungle, or missing the landing strip. At least that's the way he tells it, though as close as we can sift out the facts his most serious plane accident was having a crate of live chickens get loose in the cabin with him.

Some day, if we ever get up nerve enough to live dangerously, we want to take a trip with Oscar.

Well, knowing Oscar's lightning-rod propensity for attracting excitement, we wondered what calamity would strike when he got back. We weren't disappointed. That very day a fire broke out in our building—the new part, too. It wasn't serious—just a lighting fixture and a patch of ceiling—but it filled the halls with smoke and shut off all our lights for half an hour.

We knew Oscar was home. Dr. Very Sorry was running true to form.

—Henry D. Ralph

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LPG is the brightest spot in the fuels picture

THE brightest spot in the entire oil and gas picture is liquefied petroleum gas. The future for the whole range of natural-gas liquids appears very promising.

Starting with what was once a waste product, the LPG business has become a substantial industry in its own right. It has broadly based and diversified markets, an assured source of supply, and enough size and maturity for solid growth.

And now the industry appears to be on the verge of hurdling its biggest obstacle—the high cost of volume distribution and storage.

DURING ITS INFANCY, the industry shipped and stored LPG under high pressure in small, heavy, and expensive metal containers. This made freight and distribution costs very high. Production and distribution centers both were small and scattered. And the great bulk of LPG use was peaked in the winter months.

Now production and consumption have achieved such volume and become so concentrated that bulk shipments by pipeline are economically feasible as well as technically possible. The recent growth in pipeline movement of liquefied gases is close to phenomenal, and so is the attendant reduction in shipping costs.

Along with this development has come the widespread underground storage of LPG in mined caverns, washed-out salt beds, or geologic reservoirs. This is far cheaper and safer than aboveground steel storage and permits holding such volumes of inventories as to offset the seasonal market swings. Volume storage at both producing and consuming centers has stabilized the business for producers and reduced the possibility of consumer shortages.

Now the industry is looking closely and with great interest at another big step in transportation—movement of refrigerated liquid gas by barge or ocean vessel in insulated tanks at atmospheric pressure.

Pilot studies indicate that this method may prove both practical and economical if adopted on a sufficiently large scale. This would greatly widen the geographic spread of the market and permit LPG to compete with other fuels where it now has a price disadvantage.

LPG HAS CARVED ITSELF a varied market despite its handicaps. It competes with natural gas and heating oils in the domestic and commercial market, with gasoline and diesel oil in the motor-fuel market, and with both natural gas and refinery products in chemical and rubber manufacture. The seasonal demand swing is thus much less severe.

All these markets have big growth potentials, and if LPG can continue to shave its delivery costs as it has been doing recently, it could easily increase its percentages of all of them.

It all adds up to making LPG appear the most virile segment of the entire fuels industry.

1958 has been a year of healthy consolidation. The generally lower level of new business we have had in common with most capital goods companies has given us a much needed opportunity to examine all our operations with the emphasis on sharpening efficiencies and stepping up the rate of our technological advance. In both, we have made substantial gains.

The sharpening of efficiencies is evidenced by a number of changes. Our manufacturing costs and delivery times are both noticeably better. A reorganization of our Research & Development group has resulted in a greater emphasis on basic research and a speeding up of development of new processes and equipment. This will ultimately include more and better manpower in both these areas. We have simplified routines, eliminated many nonessential operations and projects which seem to creep in during boom times. This allows us to proceed with less staff, but a more able and experienced one.

The current lag in new business has been much less noticeable overseas, and we have been concerned with a number of very large and significant projects abroad. Our subsidiaries have continued to progress and are contributing substantially to the financial balance of our consolidated effort.

PULP AND PAPER — A Canadian pulp producer will install a complete D-O Bleach Plant, and Bleach Washers will be utilized in expansion of an Indian groundwood mill. Late in the year Brownstock Washing and Recausticizing Systems, Deckers and hypochlorite preparation equipment were ordered for a new French mill. At a second French mill, a large Brownstock Washing System was put into operation in 1958.

Recausticizing Systems will be installed at two other new mills, one producing paper in India and the other linerboard in the western United States. Continued evidence of widespread acceptance of the American Disc Filter has been demonstrated by the number of orders entered for this efficient saveall. Also of interest were filters ordered for local manufacture from our Australian subsidiary and our Japanese representative.

FOOD PRODUCTS — In the citrus industry, Merco Centrifuges and Mercone Screening Centrifuges have been applied to the finish-processing of orange juice prior to concentration. Successful also has been application of the Centrifuge-Precoat Filter combination to apple juice processing.

Corn starch washing systems consisting of various combinations of centrifugal equipment were ordered for mills in the United States, Colombia, Holland and Mexico. And, as in so many previous years, the sale of RapiDorr Clarifiers and O-C Filters for cane sugar processing has contributed heavily to orders entered.

FLUOSOLIDS SYSTEMS — Applications of the FluoSolids system were broadened in 1958 to include heat treatment or drying of such materials as foundry sand, phosphate base food products and concentrated detergent and for carbon reactivation. Another new application will be partial roasting of sulfide concentrates at one of Canada's largest smelters.

Other FluoSolids projects now in the design stage or under construction are slag dryers for India and Alabama; pyrite roasters for Spain, South Africa and California; a coal dryer for a midwestern producer and two-stage arseno-pyrite roasters for installation in the gold fields of northern Canada. Now in operation or under construction around the free world are over 100 FluoSolids installations on such proven applications as sulfide ore roasting, coal and slag drying, and limestone and phosphate rock calcination.

COAL — Fine coal recovery and water clarification will be accomplished at Eastern and Australian cleaning plants in large Thickeners ordered within the past year. In a number of instances, an American Filter and ODS Pump will complete the fines recovery circuit.

IRON AND STEEL — Proof of the versatility of the DSM Screen is its application at three points in the heavy media cyclone flowsheet. In its first use on the Iron Range it has considerably reduced magnetite losses. In this general field also, the Thickener-Filter combination has continued to be widely applied to recovery of blast furnace flue dust.

CHEMICAL — In 1958 new developments highlighted Dorr-Oliver activity in the far-flung chemical industry. Among the foremost of these was the plastic Filter, a rotary drum vacuum unit constructed of plastic with glass fiber reinforcing. Initial orders indicate the applicability and economy of this unit for mildly corrosive applications.

A second major development, the Merco H-30 Centrifuge, provides the chemical industry with a high capacity, high speed unit capable of clarifying up to 600 gallons of slurry per minute. The product of nearly four years of testing, this machine has substantially reduced operating power requirements per gallon of feed. One of the first commercial applications will be crystal separation at 90° below zero.

Result of yet another new design program is the expanded line of Type L centrifugal pumps. Here, three new designs provide increased capacity and head range and reverse inlet flow for operating speeds of both 1750 and 3500 rpm. In addition, Hypalon elastomer lining is now standard for both Olivite and ODS Pumps.

During the year a German manufacturer ordered the eighth and ninth Horizontal Filters for dewatering artificial resins, and domestic producers purchased Horizontals for such applications as washing ammonium sulfate and nitrocellulose and filtering potash and copperas. Also in the potash field was use of the DSM Screen for debrining crystallizer underflow.

GENERAL METALLURGICAL — Development of an air-lift agitation system for the American Filter has provided a third method of maintaining heavy solids in suspension prior to filtration. Complementing the conventional paddle and swing agitators, this new method has been extensively tested at operating installations.

U. S. and Chilean producers have ordered giant Thickeners with the strongest turntables ever fabricated, and a copper mill in the Belgian Congo will utilize ten large vacuum Filters in a current expansion. New construction at U. S. cement plants includes the three largest Slurry Mixers ever furnished, each 120 feet in diameter, as well as a variety of smaller machines.

WATER — Here also new construction and plant expansions resulted in application of a variety of D-O pre-treatment equipment. Two large Hydro-Treator mechanisms will supplement four additional units already in operation at Miami, Florida, and Topeka, Kansas will utilize Presedimentation Clarifiers and Flocculators. PeriFilter systems will be installed at Peoria, Illinois and Leander, Texas, and in Mexico City the first PeriFilter of a new, simplified control design is now going into operation.

Not the least of our gains in efficiency has resulted from new and vastly improved headquarters facilities both here and abroad. Our new International Headquarters was completed here in Stamford in July, the staff of D-O NV expects to move into its own new office building in Amsterdam shortly, and our associates in both Brussels and Paris are enjoying new and excellent facilities in co-operatively owned buildings.

In every respect, we are better prepared than ever before to take advantage of the upswing to come and to give better service to our customers throughout the world. This betterment, of course, could only have come about by the diligent and co-operative efforts of our total staff, and to them belongs the credit for the work done.

J. D. Hitch, Jr.
President

November 5, 1958

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Venezuela: What Course for Oil Men?

• The 10% tax increase isn't necessarily a closed issue, and what happens next is of importance to all of the world's oil countries. Biggest question: Should oil firms accept the tax hike or try to negotiate with Betancourt?

Dr. Oscar B. Irizarry
Publisher of Petroleo Interamericano, the Journal's Latin American affiliate.

THE OIL INDUSTRY is facing some ticklish decisions in handling the Venezuelan tax increase.

The truth is that everything done now—whether by oil companies or the government—has economic and political implications and ultimately will affect the world business climate for oil.

I have just returned from a 3-month swing through Latin America and had the opportunity to listen to many observers of the Latin American scene express their views on the subject.

The diversity of reactions to the situation indicates its seriousness. There is much more involved than just a 10% increase in doing business.

Here is a sampling of what some observers are saying:

The oil companies should voice their objections to the unilateral action of the provisional government as both unfair and unsound. The companies are entitled to negotiate with government officials the question of retroactive application of the new tax and try to win its revision. They have much to lose by acquiescing to the tax action by default.

Acceptance now without firm protest against a tax increase by decree opens the door to more and more of the same. It will strengthen the hands of advocates of the industry's nationalization in all countries.

In short, the Venezuelan tax decree has become a world cause celebre and can't be ignored.

Hot politics . . . The reaction to political implications is variously indicated by thinking such as this:

The tax decree has caught the oil industry in the crossfire of Venezuelan politics.

The revolutionary junta imposed the tax only a few weeks before the elected government of Romulo Betancourt was scheduled to take over. Some interpreted the action of the junta as saving the oil industry from a worse tax bite. Others saw in the decree a move to embarrass the incoming administration of Betancourt.

Still others believed that it unpleasantly surprised Betancourt and his followers. During his presidential campaign Betancourt won strong popular and press support for increasing the government's revenues from oil operations. He promised a substantial increase but also promised that it would come after proper negotiations with the oil industry representatives.

Betancourt also advocated that a national oil company or oil agency be established. It would control all further exploration in Venezuela, would deal with oil companies presently in the country, and would promote the growth of a refining and petrochemical industry.

The junta action—some thought—put Betancourt on the spot. He can't very well repudiate the tax increase, although it may be less than he visioned. Also it weakens his position in calling in oil representatives immediately to negotiate for a more liberal contribution to the nation's treasury.

What to do? . . . The question naturally arises: Should the oil industry accept the junta's increase as the better of two evils and avoid negotiating with Betancourt if possible?

There's much merit in negotiating the issue. The problem isn't going to vanish by being ignored. It's better to meet it now.

The oil companies also have some bargaining strength on their side.

They can show that:

. . . Any move to increase cost of Venezuelan oil will hurt this oil in world markets and result in less revenue to the government.

. . . Heavy taxes will make Venezuela unattractive for future investments. This is true both for new capital ventures and for policy of present companies plowing back large portions of their profits into expansion and other investments.

One of the first negotiable items is the retroactive feature of the new tax. Most observers agree it is patently unfair to call upon an industry to dig up $170 million at the end of a year's business for new taxes.

Some point out other areas where the companies can win cost relief which might offset any income-tax increase. The industry now pays a huge bill for sundry taxes, for right-of-way costs, damages, etc. Relief in these areas could be a subject of negotiation.

The protests . . . Three of the major oil companies operating in Venezuela have already protested the tax.

Of the three—Creole, Shell, and Socony—the protest of Creole President H. W. "Duke" Haight was the most forthright (OGJ, Dec. 29, p. 83).

The result is some criticism of Haight in the Venezuelan press and rumors that he went too far. But his forced removal would hurt Venezuela's prestige as an advocate of democracy more than Creole's standing as a business institution.

There are some reports, however, that a Venezuelan may eventually succeed Haight. Many experienced oil men believe such a move at this time would be most unfortunate for the man selected. He would be exposed to accusations of being unpatriotic by unscrupulous Venezuelan politicians.

If a Venezuelan is to be appointed manager of a major oil operation in his country, the move should come at a more peaceful time when the oil industry is not in the position of asking something from the government.

The future . . . How will the oil in-

dustry react if the stiff tax sticks and the anti-oil attitude presists in Venezuela?

Will any companies pull out?

Those with present investments in Venezuela naturally won't abandon them as long as there's a chance for any sort of return. The big effect of the tax will be to undermine the confidence of oil men that Venezuela is a safe place to make long-term investments.

Venezuela has long been the oil show place of the Americas. It has outstripped its sister countries in reaping the riches of ever-expanding exploration, production, and oil investment. Other countries also containing great oil potential have followed a more nationalistic route with much less successful results.

You can bet oil's answer will be noted by Middle East governments who also would like to change the rules for foreign capital participation.

The international implications and the tension in Venezuela between political leaders and the oil industry have brought the U. S. State Department quietly into the picture.

In Washington last week, Assistant Secretary of State Thomas Mann again met with officials of American companies operating in Venezuela. State Department has maintained official silence toward the tax increase.

But according to one view in Washington, the tax increase was intended partly to offset revenue lost from the anticipated clampdown on Venezuelan oil exports to the United States.

Nationalization . . . A final question arises: Is Venezuela by its tax action really embarking on a course which will lead to nationalization of the oil industry?

This may be the appearance, but many doubt the country will go the full route. Steady oil income is too vital to Venezuela's economy, and the nation would have trouble maintaining this revenue if it took over the industry.

There are two big reasons for this. Venezuela would have no marketing organization and no transportation facilities. It would take a long time and capital beyond the government's grasp to build up both.

Also it's doubtful that at this stage Venezuela could supply the management and technical skills on the broad basis that such an undertaking would require.

The best solution for both the industry and the country, all observers agree, is a negotiated understanding within the framework of economic reality and just consideration for the welfare of the Venezuelan people.

CREW AND EQUIPMENT leave Houston for long trip to Alaska where . . .

Unusual Four-Pronged Survey

COPPER RIVER basin in southeastern Alaska soon will undergo an unusual four-way evaluation that could set off an active drilling campaign.

A major U. S. oil company is laying cash on the line to find out whether the basin should be added to other prime exploration areas in Alaska.

The company, which is keeping its identity under wraps, has hired Research Explorations (Alaska), Inc., Houston, to make the extensive study.

Research Explorations will use these four methods in its integrated study of a 63-mile stretch across Copper River basin:

. . . A gravity-meter survey, with readings at ¼-mile intervals.

. . . A reflection seismograph survey giving a continuous profile of the 63 miles. Shot points will be placed at ¼-mile intervals.

. . . Refraction profiles at three strategic intervals. Each profile will be 3 miles long.

. . . A photogeological evaluation. The U. S. Government did the actual survey work 2 years ago.

Research Exploration will put together the information gathered from these four techniques and hopes to come up with a good evaluation of the basin for its client.

Columbia Buys Supplier

. . . in stock-exchange deal. Purchase of Gulf Interstate Gas system adds strength to company's long-term supply.

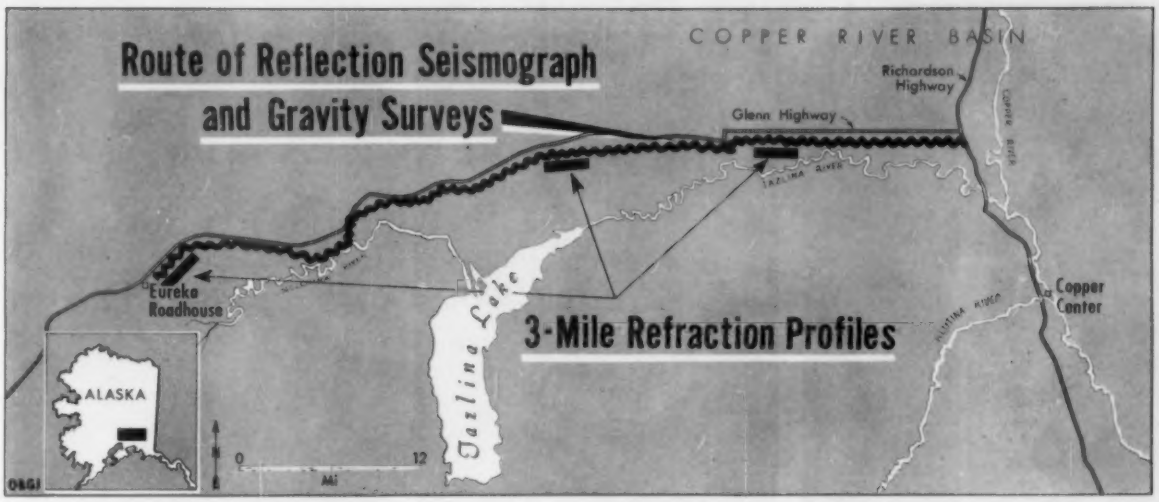
THE $200-million Gulf Interstate Gas Co. has been sold to its only customer, the Columbia Gas System, Inc.

In a transfer of stock worth approximately $67,750,000, the transmission company—with 850 miles of mainline and 310 miles of gathering lines—became known as Columbia Gulf Transmission Co.

The new company will keep its headquarters in Houston and continue to operate the pipeline system which moves Gulf Coast gas to Leach, Ky., at the West Virginia border. The company completed a $50-million expansion program last year and has assets today valued at $200 million.

John W. Kelley

John W. Kelley, the new president, said expansion plans have not been made but that nothing "substantial" is expected for 1959. Kelley moved into the Houston office last week from his former post as vice president of Atlantic Seaboard Corp., Falls Church, Va., another Columbia



EXTENSIVE STUDY will be made along 63-mile stretch of Copper River basin.

Could Touch Off New Play in Southeast Alaska

The 15-man crew left the day after Christmas for Anchorage and should be ready to start work this week.

The job itself . . . Seldom before has there been such a thorough testing—three geophysical methods, plus photogeology—to produce a report on the oil potential of a large new area.

C. R. Krampitz, president of Research Explorations (Alaska), a subsidiary of Houston's Research Explorations, Inc., says he hopes to determine what seismic methods work best in the basin, the nature of the stratigraphy, and what the basement depth really is.

Only one well has ever been drilled in Copper River. It was a 4,000-ft. dry hole near Eureka Roadhouse, on the west-central edge of the basin.

The 63-mile survey route extends east-west along Glenn Highway across the basin, slightly south of center. Beginning at Eureka Roadhouse, 150 miles northeast of Anchorage, it will run to Richardson Highway on the east side. The basin itself is 100 miles wide at its northern bulge and is 120 miles long.

Kramptiz says his crew does not expect to pin down any particular structures at this time but later will detail certain areas after evaluations of the four-pronged study have been made.

He expects to find sediments in the center of the basin at 12,000 to 15,000-ft. depths, but the seismic work should spot these depths fairly accurately. The evaluation work will make full use of the Government's earlier stereoscopic photography and magnetic survey.

Leasing. . . . Several major companies and a number of smaller independents have acreage leased in Copper River basin (OGJ, Dec. 1, 1958, p. 75).

But, to date, none has been active in geological or geophysical exploration, or in wildcatting.

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subsidiary which transported gas for wholesale customers.

Hy Byrd, who built the Gulf Interstate Gas Co. system and was its president, is bowing out of the new setup, but he will continue as president of a former subsidiary, Gulf Interstate Co., an engineering contracting firm with some producing properties. This company has designed the proposed Transwestern pipeline, which would be the first gas system operated by remote control from the start.

Gulf Interstate Co. will not be connected with the new Columbia Gulf Transmission Co., but will be a consultant for Columbia.

Several officials of Gulf Interstate Gas are remaining with the reorganized company under Columbia. Among them are Seymour M. Orlofsky, who remains as vice president.

Two officials of the old Gulf Interstate Gas Co., in addition to Byrd, will be connected only with Gulf Interstate Co.

Farrile S. Young, vice president of both companies, will continue as vice president of Gulf Interstate Co. Norman Blundell, vice president and chief engineer of the gas company and chief engineer of Gulf Interstate Co., will continue in the latter post.

Exchange basis . . . Under the stock-exchange plan, approved in December by the Securities and Exchange Commission, stockholders will receive .8 share of Columbia Gas stock for each share of Gulf Interstate Gas.

Byrd said the sale was a "good deal" for Gulf Interstate Gas stockholders, whose original shares 5 years ago cost $5.75. The Columbia Gas common stock they receive is valued at $22.

In addition, the stockholders will get one share of Byrd's Gulf Interstate Co. for each 10 shares they held in Gulf Interstate Gas Co. This is valued at $10 per share.

Purchase of Gulf Interstate Gas was a natural for Columbia, which now controls the transmission system built specifically as a contract transporter of gas for Columbia in the first place.

Bringing Gulf Interstate Gas directly into Columbia's corporate family has this mutual benefit: Columbia's long-term supply is strengthened and so is Gulf Interstate Gas' ability to finance expansion.

The system has a daily capacity of more than 660 million cubic feet of gas, which goes to various Columbia subsidiaries in the east.

In taking over Gulf Interstate Gas, Columbia assumed a $142-million debt still outstanding on construction of the big line, which consists of 850 miles of 30-in. mainline and 310 miles of 24-in. and 20-in. gathering lines.

R. P. Gregory says:

. . . 1959 will be active in pipeline construction.

. . . Construction costs definitely went up in 1958.

. . . Contractors' prices didn't keep pace with costs.

Head of Pipe Line Contractors Looks at

• R. P. Gregory, president of the Pipe Line Contractors Association, is vice president of Houston Contracting Co. He will preside at the Pipe Line Contractors' annual meeting being held this week in Miami Beach.

Q—What's ahead for contractors in 1959?

A—It appears to most contractors that 1959 will be a generally active year in pipeline construction. Volume should be greater than in 1958, and more importantly, actual construction should get under way earlier in the year.

Q—Is there a shortage of welders? If there is, how should more welders be made available for pipeline construction?

A—The general opinion among contractors is that there is no shortage of pipeline welders as such, provided the volume of main-line work is spread fairly well over the construction season. A temporary shortage could develop if all or most of the spreads were working at the same time.

The Pipeline Contractors Association recently approved the trial operation of a continuous welding school at Tulsa in cooperation with the United Association of Pipe Fitters. Both parties will finance the school which will turn out about 75 pipeline welders per year. It is estimated that this number will make up the loss by death and retirement and will add some to the industry supply.

Q—What are the prospects for automatic and other nonmanual welding methods in pipelining in 1959 and 1960?

A—The only significant development which has been made public this year is the magnetic-belt process introduced experimentally by Dr. Hans Gunther of Heidelberg, Germany (OGJ, Oct. 27, p. 52). Most observers agree that it has definite possibilities. It is now being developed further for use on large-diameter pipe.

Several other groups are experimenting with various methods and are making progress. We cannot predict, however, just what will be accomplished in the immediate future.

Q—What comment would you like to make in regard to construction with double joints fabricated either at the pipe mill or by the contractor?

A—There is considerable difference of opinion among contractors as to the relative advantages and disadvantages of double jointing large-diameter pipe prior to laying. Most will agree, however, that the actual double-jointing operation is not cheap. The final result must be weighed as to the over-all cost, the relative progress of all operations, and the vulnerability of the spread to a shortage of skilled men.

Q—How did contractors' construction costs of 1958 compare with 1957?

A—Construction costs definitely increased during 1958. Labor costs alone went up over 4%. Some manufacturers increased heavy-equipment prices about 7% in the latter part of the year. Virtually all materials and supplies went up to some extent.

Q—Are contractors' prices keeping pace with costs?

A—The prices contractors received for their work during 1958 did not keep pace with these increased costs. The trend seemed to be a continuation of the price structure which does not provide to any extent for bad weather contingencies.

Q—What progress is being made in relations between the contractors and labor?

A—Industrial relations between contractors who are signatories to the national pipeline agreements and the labor unions were generally stable during 1958, although the usual disagreements in interpretation have occurred.

. . . Labor relations have been generally stable.

His Industry

The principal problem now facing both contractors and unions is full compliance with the hiring policy interpretations recently issued by the National Labor Relations Board. Conferences are now being held to properly change the language of our national pipeline agreements.

Q—Are pipeline companies reasonable in their demands on contractors?

A—The owner company which is not reasonable in its demands on a contractor is the exception rather than the rule. The few who fall in this category seem to be very determined to stay that way. Fortunately, the great majority are fine customers.

Q—Are pipeline companies realistic in their requirements of contractors, or do excessively rigid specifications work hardships?

A—The pipeline companies have a difficult problem in that they are being forced by the economics of labor costs to reduce their maintenance forces to the bare minimum. Consequently, they must now get a more complete job from the contractor on construction down to and including fine details.

Pipeline design varies considerably between the various owner companies. Some contractors may not consider some designs realistic, but it is generally agreed that it is their prerogative to require what their design calls for.

Strike Threat Looms

. . . as industry holds the line against OCAW demands for wage boosts for refinery workers. Walkouts are imminent.

OIL INDUSTRY strike machinery is being readied on several fronts this week by the Oil, Chemical and Atomic Workers International Union, with walkouts by refinery workers considered imminent.

The union's long-stalled 1958 bargaining program appeared headed for a stone wall—with no major breakthrough that could form a general pattern for negotiations.

Here's the picture:

Companies apparently were sticking to their guns, maintaining 1958 profits were not sufficient to warrant pay raises. And OCAW President O. A. Knight states flatly that if no pay boost is forthcoming, then the union will strike.

Strike votes have been taken at most OCAW-represented plants, with others slated to vote soon on giving their union officials strike authorization. The union will be in a position to strike strategic plants by late in January.

The OCAW represents about 105,000 workers in the oil industry, mostly in refining operations. The OCAW contracts cover some installations other than refineries, such as Great Lakes Pipeline Co.

Last-ditch move . . . A meeting was under way Monday in Kansas City, aimed at breaking the deadlock in contract negotiations between OCAW and Sinclair Oil companies.

The union has its only nation-wide contract in the oil industry with Sinclair, covering 9,000 workers with Sinclair Refining Co., Sinclair Oil & Gas Co., Sinclair Pipeline Co., and Sinclair Research Laboratories, Inc. All other OCAW bargaining is on a plant-by-plant basis.

OCAW so far has been unsuccessful in attempts to force Sinclair into setting a pattern for negotiations with other companies. Sinclair-OCAW contract talks in Kansas City last November ended in deadlock after 5 days at the bargaining table. Sinclair said no wage increases were justified in the face of declining company profits.

Monday's meeting between OCAW and Sinclair officials was called by the U. S. Mediation & Conciliation Service. Included in those around the bargaining table are Millard E. Stone, vice president and director of industrial relations for the Sinclair companies, and Knight.

Knight says the OCAW has served Sinclair with a 15-day notice of intent to strike, with January 15 as the expiration date. Union officials say that means the union could call a strike any time after that date.

Other fronts . . . Knight was on the Gulf Coast last week discussing strike strategy with J. Elro Brown, the union's district director.

More than one-fourth of the union's membership is located in the Gulf Coast, and nearly all the bargaining units there have authorized Knight to call strikes as he sees fit.

Knight told members of the Texas City, Tex., local:

"It appears to be very, very clear that by the first of February you will have a wage increase or be fighting like hell to get one."

The union leader also said he expects a lengthy strike, if one occurs. "We anticipate that the oil companies will have gasoline and oil stocks on hand to last for quite a while."

At Houston's Rice hotel, James Hubbard, federal labor mediator, struggled to get the union and management of two Shell refineries together. The two refineries are operated by Shell Oil Co. and Shell Chemical Corp. They have approximately 2,500 OCAW members.

On the West Coast, OCAW members employed by five plants in the Los Angeles Basin will take strike authorization votes by January 21. Some 4,500 employes of Richfield of Los Angeles, Texaco, Shell, Union Oil, and Tidewater are eligible to vote.

Union demands . . . The union opened negotiations last February with oil companies covered by contracts.

The OCAW asked a 3½% increase for greater productivity, a cost-of-living adjustment since union members' last general increase in May 1957, adequate notice of impending layoffs, and substantial severance pay for laid-off workers. The union estimates this package is worth 21 cents an hour.

All companies flatly rejected the demands.

In September, the union sent word to its locals that they could seek either the mandatory program adopted in February or a 25-cent-an-hour, across-the-board increase. This alternative goal also had no takers.

Oil Issues Rise Early

. . . as Eighty-sixth Congress goes through preliminaries. Natural gas, imports, depletion bills quickly introduced.

NATURAL GAS, oil imports, and the depletion allowance are living up to their early promise of becoming major issues this year when the 86th Congress gets down to serious work.

On opening day of the session last week, Rep. Oren Harris (D-Ark.) reintroduced a watered-down version of his natural-gas bill.

Except for one major concession to coal producing states, the bill is almost identical to the one which was reported out by committee but never came up for a vote in the last Congress.

The bill would remove independent natural-gas producers from the utility-type price controls which were inaugurated by the Supreme Court ruling in the controversial Phillips case. The so-called "coal" amendment, not contained in the earlier version, would prevent offpeak gas sales at less than comparable rate for gas to be resold by distributors.

Backers of the measure believe the concession to coal producing interests, although strongly opposed by transmission companies, greatly improves the bill's chances for passage this year.

Imports . . . Bills to reduce imports of residual oil also were among the first introduced.

On opening day, Rep. Elizabeth Kee (D-W. Va.) served notice that coal interests will try again to rewrite the oil-import program. Rep. Kee tossed in three bills to help coal compete with foreign oil.

Two of her proposals would reduce residual imports, one by limiting them to their 1954 ratio to domestic production and the other by setting a flat quota at 5% of anticipated domestic demand.

The measures are similar to bills introduced by Rep. Kee in the last Congress.

In the past 2 years, coal-state delegations made a dozen unsuccessful attempts to impose limitations on foreign oil. Most of the proposals were aimed specifically at residual.

Rep. Kee also reintroduced a bill to increase the depletion allowance on coal from 10% to the 27½% rate applied to oil.

Oil set back . . . The depletion rate on oil, which is expected to become a major issue this year, suffered a setback on opening day as result of a lottery held in the Senate chamber.

The two Democratic senators representing the new State of Alaska drew numbers to determine the duration of their terms.

Sen. Ernest Gruening, who opposes the present depletion allowance, won the right to stay in the Senate until 1963. His colleague, Sen. E. L. Bartlett, an advocate of the present depletion rate, drew a shorter term, expiring in 1961.

Each of the two senators failed to draw the 6-year prize which normally goes with election to the Senate. Length of their terms had not been specified when they were elected.

Other early bills of importance to the oil industry include one to encourage overseas investments and another to provide federal aid for airport construction.

Judge Halts Plans

for Rhode Island refinery. Firm undaunted by ruling.

OPPONENTS of Commerce Oil Refining Corp.'s proposed $55-million refinery on Conanicut Island near Jamestown, R. I., have won the latest round in the fight to block construction of the refinery—but Commerce officials are neither dismayed nor discouraged.

Federal Judge Edward W. Day ruled last week that the refinery would constitute a nuisance because of noxious gases and odors. He issued a permanent restraining order against building the plant.

Harold M. Geller, Commerce's counsel, said that if necessary "we definitely are going to appeal the decision." Commerce officials are confident that they would win on an appeal. They say the refinery would not constitute a hazard and that both state and local officials are in their corner since the plant would be located in a distress labor area.

While they had not yet been able to study Judge Day's 30-page decision, the Commerce people expressed satisfaction with that part which nullified Jamestown's zoning and licensing ordinances. They also expressed surprise that the decision was apparently based mostly on air pollution and seemingly ignored water pollution. Judge Day ruled that the odors would diminish property values on the island in Naragansett Bay.

The original permit for the construction of the refinery was issued back in May 1955. Commerce had an agreement with Gulf Oil Corp. by which Gulf would furnish the crude from Venezuela and would distribute the refinery products. The original contract expired a year ago, and the principals decline to state whether it has been extended.

Big Holdings Sold

in Dora Roberts as General American hikes ownership.

GENERAL AMERICAN Oil Co. of Texas last week bought another multimillion-dollar chunk of big Dora Roberts field in Midland County, West Texas.

The company will pay about $12,000,000 for a one-quarter working interest to a group of investors directed by Empire Resources Corp., New York, and Lazard Freres. The sellers will get $1,200,000 in cash, the rest in reserved payments from oil production.

General American estimates it will realize about 11,000,000 bbl. of crude oil and 60 billion cubic feet of gas through the purchase. The company also bought an added interest in the field's casinghead gas plant for roughly $1,000,000.

Included among the sellers of the property were the investment banking firms of Wertheim & Co., Goldman Sachs, and Shearson, Hammill.

Up to half . . . The new purchase hikes General American's Dora Roberts ownership (including the former Warsan and Virey fields now consolidated into Dora Roberts) to roughly one-half the total working interest.

Last spring the company bought Forest Oil Corp.'s 25% working interest in the field plus its 25% interest in about 9,000 acres of undeveloped leases on the Roberts ranch and an 18¾% interest in the field's natural-gasoline plant (OGJ, Apr. 14, 1958, p. 76).

General American in that deal paid $16,000,000 ($1,600,000 in cash, the rest in reserved oil payments) for an estimated 13,000,000 bbl. of oil and condensate and 60 billion cubic feet of gas.

Dora Roberts field has 93 wells and produces from the Ellenburger, Devonian, and Pennsylvanian formations. Only other major working-interest owner in the field is Cities Service Oil Co., which operates the holdings.

SPRAYER goes to work and . . .

SKID-MOUNTED pipe is covered with 1½-in. concrete blanket as . . . . .

Weight-Coating Job Is Performed Along Ditch

SOMETHING new in concrete coating of pipe was tried by Service Pipe Line Co. in relocating almost a mile of its Slaughter-Drumright crude trunk lines.

Service sprayed the pipe over the ditch, rather than in a yard. The entire welded line was sprayed in one operation, instead of one joint at a time, in an attempt to cut handling costs of weight-coated pipe. The method was reported to be successful and will be considered by Service on future projects.

The experiment was made in the relocation of a 4,786-ft. segment of two parallel 16-in. lines across the bed of the new Fort Cobb Reservoir being built in Caddo County, western Oklahoma. When the dam is completed the lines will be under water 40 ft. deep at some points.

Seamless pipe, coated at the mill with coal-tar enamel and wrapped with 15-lb. aspestos felt, was specified for job. The pipe was welded and left on skids to be sprayed. The wet cement spray was applied all around the pipe, over a reinforcing wire mesh, to a thickness of 1½ in. Two spraying applications were required on the bottom of the pipe to obtain the proper thickness.

The heavy-jacketed pipe, weighing 6,000 lb. per 40-ft. joint, was buried 30 to 36 in. below the lake bed. Tie-ins occasioned only brief interruption of service.

M-R Co., Wichita, Kans., was prime contractor, and C. E. Schniepp Co., Dodge City, Kans., did the concrete job.

the JOURNAL *said* . . . . .

50 *years ago*

January 6, 1909

A franchise to pipe Bonham, Tex., for natural gas has been obtained by Paul J. Mahoney of Pittsburgh. A supply has been developed at Ector, just west of Bonham. Gas from the Caddo, La., field will be piped to Marshall, Tex., for domestic use April 1. H. S. Grayson of Pittsburgh has been awarded the Marshall franchise.

Ten shallow-draft barges, 90 ft. long and with 1,000 bbl. capacity, have been purchased by the Pearsons organization. They were built at Texas City, Tex., and will transport oil from the Dos Bocas field to Tampico, Mexico.

J. L. Dowling is named general superintendent of the Texas division of The Texas Co.'s pipeline department. He supervised construction of the Texas' 8-inch trunk line from Glenn Pool to Texas.

25 *years ago*

January 11, 1934

The public paid $320,000,000 less for gasoline in 1933 than in 1926, but used 110 million barrels more.

P. H. Bohart, general agent of Mexican Gulf Oil Co., in Mexico, is named vice-president of Gypsy Oil Co.

A. E. Bradshaw, a banker in Tulsa since 1901 and former Missouri country school teacher, left presidency of Oklahoma Natural Gas Co. to become president of National Bank of Tulsa. E. I. Hanlon is made board chairman of the bank.

A survey of three Termo Corp. wells at Huntington Beach, Calif., to determine if they penetrated the tidelands, is ordered by court. The state of California sued Termo, contending enough wells had been completed in tidelands and that additional drilling would jeopardize production.

10 *years ago*

January 13, 1949

Investment of a quarter-billion dollars is involved in Texas' postwar program to conserve 2¼ billion cubic feet of casinghead gas, Hines Baker, Humble Oil president, told the Rotary Club of Beaumont in a meeting observing the forty-eighth anniversary of the Spindletop field discovery.

A new company, Conorada Petroleum Corp., with A. A. Curtice as president, has been formed for development of foreign properties by Amerada Petroleum Corp., Ohio Oil Co., and Continental Oil Co.

Oil companies operating in Germany plan on making 1 million feet of hole in an extensive drilling and exploration program, with emphasis on wildcatting in Alpine foothills of Bavaria. Assistance of German and British-United States military-government authorities has been assured.

Small-Tract Drilling Due Court Tests

• Texas cases attack Railroad Commission's controversial "Rule 37" which permits drilling on small tracts. Two suits are filed in connection with drilling permit, allowable formula for 1/5-acre lease in Normanna field.

DRILLING on pint-sized tracts in Texas is under attack in the courts.

Coming up early next month are hearings on two suits filed by Atlantic Refining Co., Tidewater Oil Co., and other operators in federal district court in Austin.

One attacks the authority of the Texas Railroad Commission to approve drilling on tiny tracts through the "Rule 37" exception to state-wide spacing regulations.

The other challenges the commission's practice of basing allowables in gas fields with such small-tract wells on a two-thirds acreage one-third well formula.

If the plaintiffs win both or either of these suits (and if the decision should stand up under appeal), small-tract drilling likely would die out in Texas.

This would be a momentous victory for conservationists who contend that such drilling each year breeds large numbers of unnecessary wells. These, they say, in turn inflate the unit cost of producing petroleum in this country to the point where it cannot compete with foreign oil.

The elimination of wells not needed to drain the oil or gas from a reservoir is the prime objective of the Oil Industry Conservation Forum launched only last year but gaining strong and growing support from majors and independents alike.

The test cases . . . The suits filed by Atlantic, Tidewater and other operators attempt to upset commission orders relating to the Normanna gas field in Bee County on the lower Gulf Coast.

The commission in one instance has granted a permit to Bright & Schiff, Dallas independent operator, to drill a well on a 1/5-acre lease. The Atlantic-Tidewater attack on this permit will be heard by District Judge C. O. Betts February 2.

Plaintiffs contend that the gas and gas liquids in place under the tract are too small to pay for the cost of drilling the well. Atlantic's engineers estimate that only $15,000 worth of minerals underlay the lease.

Under the commission proration order for the field, however, the Dallas independent would be permitted to produce a thousand times that amount—roughly $1,500,000 worth, Atlantic engineers contend. Operations generally in the field are geared to 320-acre spacing.

Plaintiffs argue that legally the Bright & Schiff lease is too small to qualify as a valuable property right—that, since in-place gas could not pay for a well, Bright & Schiff is not entitled to drill.

The second suit, set for February 9, attacks the proration formula which would permit the Dallas company to produce so much gas.

The commission, through its two-thirds acreage and one-third well proration formula in Normanna, will permit the Bright & Schiff well to drain hundreds of thousands of dollars worth of gas from under leases of adjoining operators, plaintiffs contend.

They seek an order basing proration 100% on acreage or one restricting the well factor in the formula to 5% or less.

Bright & Schiff, meanwhile, together with the commission, defend the commission orders as consistent with past proration practice. They contend that Bright & Schiff is entitled under the "law of capture" to drill a well and recover expenses plus a reasonable profit, even if drainage results.

One round already won . . . . Bright & Schiff already has won one round in the court squabbles.

A district judge in Beeville, Tex., enjoined Atlantic from interfering in the Dallas independent's negotiations to lease surface rights on land adjoining its 100 by 150-ft. tract so as to obtain enough space to accommodate a rig.

The surface acreage in question was on land on which Atlantic held mineral rights. Atlantic sought to block the surface lease on grounds that the landowner could not sell surface rights to competing drillers which would be detrimental to his own mineral lessee.

Atlantic has appealed the judge's adverse decision to the San Antonio Court of Civil Appeals.

The background . . . Drilling on small tracts under Rule 37 exceptions has long been a thorn in the side of the oil industry in Texas.

And, lately, such drilling has become more intensive with some operators appearing to make a specialty of it.

Members of the Texas Railroad Commission decry the practice but feel that they are powerless to prevent it due, they say, to past court decisions. These were based on the "law of capture" which in turn stemmed from the mistaken belief prevalent many years ago that oil existed and flowed underground in the form of rivers or lakes. Thus, there could be no ownership of oil or gas in place and whoever tapped the deposit was entitled to produce as much as he could.

The courts dictate, according to the commission, that the commission must not only permit small-tract wells in most instances to be drilled but must permit them to produce enough to make a reasonable profit.

To avoid having to go into costs in each case of this sort, the commission through the years has settled upon a yardstick by which it bases proration in gas fields one-third on the well and two-thirds on acreage, while in oil fields the formula is 50-50 as to acreage and well factor.

Acreage formula needed? . . . A solution to the small-tract drilling problem that has been advanced by several operators is that the commission adopt

PIPELINE

Two important pipeline hearing dates have been set by the FPC. Hearings will resume February 16 on Midwestern Gas Transmission's proposal to supply natural gas to the Chicago-Gary area. The FPC will resume hearings April 13 on Transwestern Pipeline's application to build a line from West Texas to the California border.

Construction is almost complete on the 118½-mile Delta pipeline which Shell Pipe Line is building from the Louisiana Gulf Coast to its Norco refinery near New Orleans. Contractors on the line, ranging in diameter from 8 to 20-in., were Houston Contracting, Glaser Construction, and J. Ray McDermott. Delta Engineering

a policy of setting proration formulae for fields based on acreage only. This, they say, would make it uneconomic for an operator to drill on tiny leases.

Members of the commission, however, feel it would be useless for it to do this in that the courts, they say, would set such orders aside and remand the cases.

One commissioner, in a Journal interview, labeled the agency's present system as "unpalatable." It's not right, he said, to protect one party from confiscation by confiscating many times more from another. Furthermore, the industry "can't afford to drill unnecessary wells now."

Nevertheless, he feels the commission can't do much about this situation. He thinks the only answer to small-tract drilling in Texas is passage by the legislature of an equitable acreage-pooling law. Such a law would force holders of tiny leases into large development units but at the same time insure that they share fairly in the production.

A substantial number of oil's legal experts in Texas, however, think the commission is wrong—that the agency should take the lead in eliminating small-tract drilling which it admits is resulting in "economic waste."

Similar suits may be forthcoming in the state's Port Acres and Alta Loma gas-producing areas in Jefferson and Galveston counties. Drilling permits have been issued recently for wells in these fields on plots of 1 acre or less.

One thing is certain: Texas conservationists are determined to put a stop to small-tract drilling. If it can be done in the courts: Fine. If not, then they'll go to the legislature.

AIRPORT PAVEMENT is ready for jet-plane service after . . .

Asphalt Mix Makes Debut

SHELL Oil Co.'s epon resin asphalt concrete is being used commercially for the first time. United Air Lines has paved 3½ acres of its jet base at San Francisco's International Airport with the new product.

The new pavement is conventional asphalt with epon resin and a plasticizer added. It can be made in standard hot-mix plants and applied with conventional equipment.

The plastic-asphalt mix can be used in a ½ to ¾-in. layer over existing pavements and will withstand high temperatures from jet exhausts. It resists solvent action from jet fuel, gasoline, hydraulic fluids, and cleaning solvents.

Shell says the new product doesn't deform or pull loose under extreme loads imposed by the huge new passenger planes and bombers. It combines the superior flexibility of asphalt with the strength of concrete.

Shell engineers said that because of its high strength and resilience, paving thickness for new highway construction can be reduced.

BRIEFS . . .

installed pump stations at Main Pass, Ostrica, and Pilottown. The line will have initial capacity of 90,000 bbl. daily and will handle Delta production formerly transported by barge.

A 736-mile construction program was completed during 1958 by Southern Natural Gas. The mileage included supply lines to fields on the Louisiana coast and main-line loops between Louisiana and Georgia. Next year the company plans to lay 377 miles of pipeline.

Commercial jet fuel, designated O grade, is now being handled by Great Lakes Pipe Line for a shipper at the Kansas City terminal. The move heralds the beginning of jet airliner service through Kansas City. Great Lakes publishes specifications for 15 grades of products, including military aviation gasoline. The company started handling A grade avgas at Kansas City last month. Two grades are handled at Omaha and one at Minneapolis.

A 1,365-mile construction program was completed during 1958 by El Paso Natural Gas Co. A compressor-station expansion in Arizona is nearing completion. Western Pipeline installed 17,500 hp. at Window Rock during November. Fluor Corp. installed 10,000 hp. at Seligman and Leupp stations last month and will complete 9,400 hp. at Williams this month. At Dilkcon and Flagstaff stations, also in Arizona, 10,000 hp. is planned for completion by November 1959, pending approval of the Federal Power Commission.

Also for Pipeliners . . .

IN THE NEWS: Gulf Interstate Gas has been sold to its only customer, Columbia Gas System (p. 44) . . . Head of Pipe Line Contractors takes a look at his industry (p. 46) . . . Service sprays concrete coating on pipeline over the ditch (p. 49).

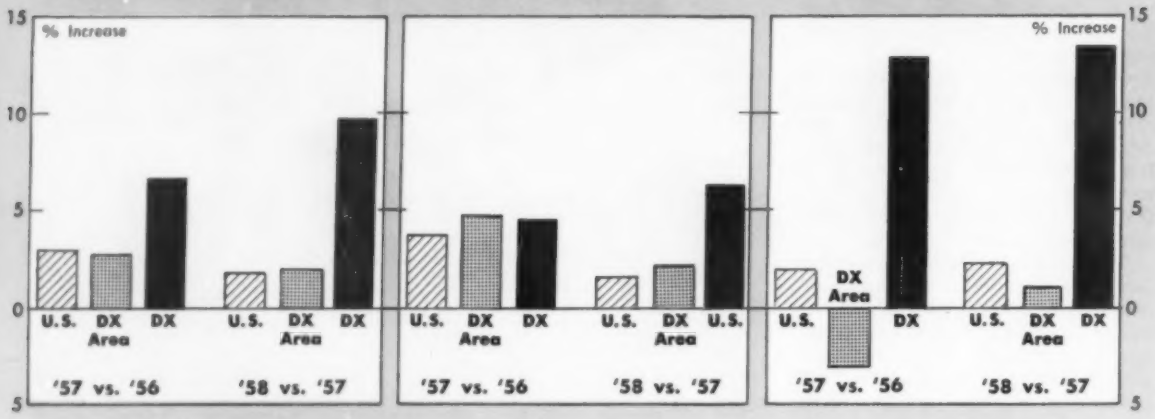
PLUS THIS TECHNICAL FEATURE: Automatic computation speeds pipeline-investment analysis (p. 69).

Here's How DX Sunray's Gasoline Sales Have Climbed

TOTAL GASOLINE SALES are well above area and U. S. figures.

REGULAR showed its strength during 1958. But it is . . .

PREMIUM that has really rung the bell in the past 2 years.



1958-57 comparisons cover first 9 months of each year.

D-X Proves Promotion Pays Off

• Tulsa firm has no secret formula for selling gasoline in a tight market. Its jump in gasoline sales can be attributed to an aggresive service-station expansion and a hard-sell campaign started when premium Boron gasoline was introduced in mid-1956.

A BIG D-X sign went up over an Indianapolis service station last week, and a Tidewater sign came down.

The occasion, unmarked by fanfare, for some meant merely the climax of a business deal whereby D-X Sunray Oil Co. purchased the marketing facilities in the Mid-Continent region of Tidewater Oil Co.

But for oil marketing people the switch of signs was another chapter in an amazing story being written by D-X Sunray entitled: How to sell more gasoline in a tight market.

D-X Sunray over the years has earned a reputation of being a strong marketing outfit. But since the company introduced its premium Boron gasoline in mid-1956, its sales give the appearance of heading for outer space.

The sales record briefly is this:

Boron gasoline in 1957 marked up a 12.9% sales gain over premium sales of the year before. For the first 9 months of 1958 they went up another 13.2% over the same period in 1957. At the same time average premium-gasoline sales for the nation only showed a 1.5% gain in 1957 and a 2% gain for the first three quarters of 1958.

D-X housebrand gasoline didn't stand still either. Its sales gained 4.5% in 1957 and another 6.2% for three quarters of 1958. The U. S. average for the two periods was 3.5% gain in 1957 and 1.3% in 1958.

D-X total gasoline sales gained 6.5% in 1957 and 7.9% in 1958, and in every case outstripped the sales averages of both the D-X marketing area and the country at large.

As the figures indicate, D-X sales jumped remarkably at a time when the oil industry was crimped by a general sales slowdown and many strong firms actually were losing gallonage.

The explanation . . . What's D-X Sunray's secret for selling?

Do company executives have a formula for success?

The Journal surveyed D-X Sunray executives to find out. What turned up is simple: D-X Sunray's secret is just doing a better job with tried-and-true business and sales techniques. And it uses the full bag of tricks.

Its sales organization is like a championship football team which uses the same plays as the losers but runs them so hard, fast, and expertly they go for scores.

This organization is backed by an expansion policy which is steadily adding new outlets either by purchase, negotiation, or new building.

D-X Sunray President R. W. McDowell, a veteran oil marketing executive, says his company enjoyed good sales before Boron. But he attributes the phenomenal sales gains of the past 2 years to the comprehensive campaign designed and carried through with the introduction of the new premium motor fuel in the company's 19-state marketing area.

From the start, the new program had two big jobs:

. . . Increase sales in face of a declining industry-wide demand.

. . . Counteract growing consumer belief that all gasolines are alike.

The approach . . . The first move was a huddle of advertising, sales promo-

Sunray Mid-Continent's Policy: Merge, Buy, or Build

GROWTH is a basic philosophy with Sunray Mid-Continent Oil Co. and its subsidiaries, whether by merger, purchase, or new building.

Under the leadership of Sunray Chairman C. H. Wright, this policy has brought the company into the top ranks of domestic integrated oil companies.

The growth is continuing. During the past 2 years, D-X Sunray Oil Co., the marketing and refining subsidiary, has supplemented its own stepped-up service station building program by purchasing 12 oil-jobbing companies.

Largest deal was purchase of Tidewater's Mid-Continent marketing facilities. Other purchases were Cook & Brown Lime Co., Oshkosh; Fenley Oil Co., Mineral Point; and Stellick Oil Co., Onalaska, all in Wisconsin; Petring Motor Co., Norfolk, Neb.; Shackelford Oil Co., DeQueen; Green Oil Co., Little Rock, Ark.; Valley Oil Co., Shelby; J. B. Carpenter & Son Oil Co., Pontotoc; J. H. Hector Oil Co., Clarksdale, Miss.; Jet Oil Co., Dyersburg, Tenn.; and Gafill Oil Co., South Bend, Ind.

Biggest step forward in history of the present company was the 1955 merger of Sunray and Mid-Continent Petroleum which united a company strong in exploration and production and one dominate in refining and marketing.

Before that, Wright had enlarged Sunray by a series of mergers or other acquisition of smaller drilling, development, and producing firms. These included Superior Oil Corp. in 1943, Darby Petroleum Co. in 1944, Bel-Air Oil Co. and Bell Oil & Refining Co. of California in 1946, Transwestern Oil Co. in 1948, and Barnsdall Oil Co. in 1950.

Mergers, however, don't tell the whole story of Sunray's growth. Results of its aggressive selling campaign are told in the adjoining story. In other areas the company has:

... **Upgraded** its refining facilities to meet expected octane requirements for at least 3 years.

... **Entered** exploration deals that put it in gulf inland water area and abroad in the Middle East, Venezuela, Canada, and Alaska.

... **Started exploring** a vast portion of the Mojave Desert for petroleum and solid minerals.

... **Continued** an aggressive drilling and production program in domestic oil regions.

D-X SIGN goes up, Tidewater's Flying A comes down, signaling another D-X expansion.

tion, research, and manufacturing people.

The research and refining departments at the time were in the midst of an expansion project which finally culminated last year with completion of a new research lab and five new UOP process units at the West Tulsa and Duncan refineries. Aim of the construction was to upgrade product quality as well as boost motor-fuel capacity.

The marketing-manufacturing conference finally decided just what the best possible product improvement would be. After this decision, marketing and advertising executives sat down with the company's advertising agent and came up with a new sales plan.

The over-all program included:

... **Announcement.** The new D-X Boron gasoline was introduced to dealers, distributors, and the sales force with a series of 23 meetings in the marketing area.

Top officials, including the president, vice president, and executives for refining, sales, and advertising, attended the meetings in person. The troupe traveled in a chartered bus and staged a program which included 3-D color movies and a Cadillac test car with $15,000 worth of instruments mounted on it. Test engines also were used to prove the superiority of D-X Boron to competitive products.

... **Advertising.** The advertising program spanned the field of major media. In most cases copy featured a rocket, jet, or missile to show the big advance marked by D-X Boron.

The story was splashed in 300 daily newspapers, over 40 television stations, on 24 sheet posters in 568 markets, on half of the company's 800 painted highway boards, and with summer spots on 55 radio stations.

The Boron theme also was played up in D-X farm information center programs beamed to farmers on 27 power radio stations and in schedules placed in 14 state and regional farm papers. Other advertising schedules were placed with selected trade papers and Life Magazine.

... **Merchandising.** A carefully planned effort backed all media used. This was aimed at employes, the sales force, dealers, distributors, and stockholders as well as the general public.

Point-of-sale kits for spring and fall were furnished to all D-X service stations. In this connection, research revealed that the big red arrow to identify a station was a powerful tool for pulling prospective customers. It ranked with newspaper and TV advertising as a major reason motorists tried D-X Boron for the first time.

Many sales promotion ideas also were used. The more successful included:

... **Boron Days promotions.** A special hoopla, normally lasting 2 days, was staged at hundreds of service stations. The company furnished the ideas and format, and the dealer bore the full cost. The sales results and new customers obtained made the efforts worthwhile.

... **Special training.** Station attendants were trained to approach the customer on the drive with this breezy question: "Fill 'er up with D-X Boron, Sir?" Driveway salesmen also were encouraged to answer customer in-

Coming This Month

PETROLEUM PANORAMA

BAKU, RUSSIA? No, it's Burbank, Okla., back in the early 1920's. The Old World look of these boarded-up derricks spelled the beginning of the end of an era: The era when plumes of oil and gas against the skyline meant another well coming in.

When the larger wells of the prolific Burbank field were brought in, operators pulled casing before shooting them. Then, while casing was rerun, the wells flowed wild.

This operation made for a good bit of oil gushing about the place. So, the derricks at Burbank were boarded up to direct this oil back into slush pits to be reclaimed later.

Less romantic and exciting perhaps than gushers wetting down the landscape, but certainly more practical. Here then, began the first stirrings of "conservation," a concept which has since guided the oil industry to recover a maximum amount of this irreplaceable resource.

Petroleum Panorama, the Journal's Centennial gift to the industry, recounts this fascinating story of oil's progress in conservation. Containing gushers inside these wooden derricks was barely the beginning. Petroleum Panorama refers again and again to the successive techniques by which an industry lived up to its responsibility for keeping the nation fueled and lubricated.

From the simple devices designed to prevent waste at the wellhead, engineers turned to the challenge of recovering more and more oil from underground reservoirs. The whole gamut of these techniques from the early water floods to today's fire floods and miscible-phase programs is there in Petroleum Panorama.

But conservation was more than techniques and equipment. It became a state of mind. Proration, unitization, and wider well spacing stand equally important in the picture. You'll find these milestones listed, too.

How can you get a copy of this Petroleum Panorama? It's easy if you're a subscriber as of January 28. For on that date this centennial issue will be mailed to everyone on our circulation list. It is a completely separate 53rd issue of the Journal, not a supplement. We think it is something you will want to keep for reference for many years to come. It's a long time before the next one.

quiries about D-X Boron with the reply: "It's what makes those rockets go."

. . . Contests. Various events were staged among employes, dealers, district managers, and distributors to encourage them to make that extra sales effort.

Back of these major promotions were an intensive drive to increase number of credit-card holders, special exhibits and test-car showings at state fairs and conventions, training films, and a large variety of promotion gifts.

After D-X Boron was on the market for 6 or 8 months, a series of meetings was started in service stations to keep the interest and knowledge of dealers high. Extensive advertising research also was conducted to test effectiveness of the campaign.

An important fact of this extensive program is emphasized by C. F. Niessen, manager of D-X advertising and sales promotion. He said no large increase in the advertising and sales promotion budget was allocated to promote the new product.

Since the budget is related to gallonage, the increased sales provided the extra revenue for the program.

Expansion . . . While the sales department was busy pushing products, it was equally as busy expanding service station outlets.

In the last 2 years D-X Sunray has purchased outright 12 jobbers, climaxed just last month with the Tidewater purchase.

S. D. Breitweiser, vice president for marketing, reported that for the last 3 years D-X Sunray has been building at an accelerated pace.

"We have the chosen assignment," he said, "of building new stations in areas where we already are represented—to fill in existing voids—and in areas where we are expanding beyond our historic boundaries."

Breitweiser declared D-X Sunray plans to continue this building program, supplemented by acquisition of outlets by other means. The program will have a double goal: Put a D-X service station within reach of every motorist in mid-America and then persuade him to drive in and buy D-X gasolines and products.

Humble Will Drill

deeper in Alaskan wildcat. Log findings not revealed.

HUMBLE OIL & Refining Co.'s wildcat well on the Alaskan Peninsula has drilled to 13,287 ft. without finding a producing sand and is now scheduled to go to 13,500 ft.

Humble, though releasing only a brief report, gave a slight indication of encouragement in the expensive drilling effort by lowering the depth goal. When spudded September 23, 1957, the well's projected depth was 12,500 ft. Last month the goal was changed to 13,000 ft. and last week to 13,500 ft.

The well is the Bear Creek Unit No. 1, the first drilled on the Alaskan Peninsula near Kanatak Bay under a contract agreement with Shell Oil Co. By drilling three wells, Humble will earn a half interest in the 260,000-acre lease.

Logs have been run on the well, but Humble is keeping its findings to itself, except to say that no producing sands have been encountered.

Kenai well . . . Standard Oil Co. of California is completing its 2 Swanson River Unit on the Kenai Peninsula as a dual producer. The test is Alaska's second commercial well.

The 2 Swanson River Unit has tested 980 bbl. daily from the two zones. The upper interval at 10,804-78 ft. flowed at the rate of 500 bbl. daily of 30-gravity crude through a 24/64-in. choke. The lower zone at 11,038-60 ft. tested 360-480 bbl. on a 2-hour gage.

Crackdown Ordered

on Alaskan oil operators who violate acreage limitations.

INTERIOR Secretary Fred A. Seaton will crack down on violations of the acreage limits to federal oil leases in Alaska.

The cabinet member last week announced plans to take "administrative action" against oil operators believed to have violated the mineral leasing act.

Plans call for cancellation by the Bureau of Land Management of leases in excess of acreage limitations. Seaton indicated the first complaint may be prepared by the end of the week.

Seaton pointed out that under the mineral leasing law no company or individual may hold more than 46,080 acres in federal oil and gas leases in any one state except Alaska. The limit in Alaska is 100,000 acres. In addition to actual leases, the law allows option on up to 200,000 acres in a single state.

Evidence gathered by Interior officials indicates a "considerable" number of leases have been acquired illegally through "dummy" applications. Seaton noted that fraudulent applications in some cases appear to have been filed by relatives, employes, and friends of oil operators involved.

New lease . . . In other action, the Interior approved a contract under which Richfield Oil Corp. will conduct a long-range oil exploration program on a lease covering nearly 490,000 acres in southern Alaska.

The contract calls for Richfield to spud a wildcat on the acreage before the end of this year. In addition to the cost of the first well, Richfield is to spend at least $900,000 in exploration by the end of 1962.

Acreage involved covers nearly half of the sprawling Katalla-Yakataga lease on which Phillips Petroleum Co. formerly held a development contract. Phillips and its partner in the venture, Kerr-McGee Oil Industries, Inc., relinquished the lease after three wildcats had been drilled.

The new contract with Richfield covers 489,662 acres designated as the Katalla-Yakataga No. 1 (South) tract. Richfield has applied for a second development contract covering the remaining 571,121 acres of the old Phillips tract. Secretary Seaton has held up action on the second proposal, thus giving other companies a chance to compete for the acreage.

Land to be explored by Richfield is along the coast of the Gulf of Alaska, east of Copper River and west of Icy Bay.

watching WASHINGTON

Joe Reilly

• O'Mahoney loads gun for new oil probe.

THERE WERE FEW CONGRESSMEN more eager to get back on the job last week than Sen. Joseph C. O'Mahoney.

When Congress convened, the 74-year-old senior senator from Wyoming already was neck-deep in plans for another investigation. It was to be aimed at his favorite target—the oil industry.

O'Mahoney had been making threatening gestures for several weeks before the new Congress met. He had been highly critical of the administration's delay in working out a new program to control oil imports. He had concluded several weeks ago that, as far as the imports program is concerned, "it is now up to Congress."

The imports situation opened the door for another O'Mahoney investigation. If he follows past performances, though, the probe will cover just about all segments of the industry.

In 1957, O'Mahoney started an investigation of the American oil industry's performance during the Suez crisis. The study continued intermittently for several months. It touched on the emergency oil lift to Europe; then it spread into pipeline operations, depletion allowance on foreign oil, effect of imports, advantages of major companies over independents, "monopoly" allegations, and numerous other industry practices, either real or imaginary.

The investigation got its share of headlines as oil men paraded before the subcommittee to answer allegations and innuendoes. But the probe turned out to be a little frustrating because members of the subcommittee did not agree on their findings. Some of them actually thought the domestic industry had done a commendable job in supplying oil for Europe when Middle East supplies were shut off. They insisted on expressing their views in a dissenting report.

Now O'Mahoney is ready to resume his attack. It promises to be a busy session for oil executives.

• Congress may take closer look at FPC.

MEMBERS OF THE FPC CAN EXPECT to face another inquiry this session.

The House subcommittee on legislative oversight found the Federal Communications Commission so interesting last year that it didn't pay much attention to the other five federal agencies which it started out to investigate.

Late in the year, members of the now-defunct subcommittee did look into the FPC briefly. On first glance, they objected to the FPC's liberal use of its power to grant temporary permits for pipeline projects. But their FPC findings were an anticlimax after the revelations concerning Sherman Adams, Bernard Goldfine, and vicuna coats.

Subcommittee members have recommended that the investigation be resumed by the new Congress. They also have proposed a group of laws to reduce the temptation for businessmen to put pressure on federal agencies handling cases in which they are interested.

If Congress follows through, one of the subcommittee recommendations might pave the way for William R. Connole to become FPC chairman. The recommendation would permit a federal commission to name its own chairman. Now, he is appointed by the President.

Connole, youngest member of the FPC, recently was elected by fellow commissioners to serve as vice chairman of the FPC. He succeeds Frederick Stueck, whose term expires next June.

According to the grapevine, Chairman Jerome K. Kuykendall, a Republican, may be in line for appointment to a federal judgeship before Ike leaves office.

Connole classifies himself as an Independent politically. He is a native of Connecticut.

STUDYING briefs filed in the Government's price-fixing case against 29 oil firms is Federal District Judge Royce H. Savage in Tulsa.

Oil-Conspiracy Case Opens

. . . on new legal battleground. Dismissal of indictment is sought by companies charged with fixing gasoline prices.

AN ARRAY of legal talent was on hand as another round in the Government's price-fixing case against 29 oil companies got under way Monday in U. S. District Court in Tulsa.

In the first action since the case was transferred to Tulsa from Alexandria, Va., Judge Royce H. Savage was hearing a number of motions filed by each side.

The motions filed by the oil companies request:

. . . **Dismissal** of the one-count indictment charging the companies with conspiring to raise crude and gasoline prices in January 1957.

. . . **Return** (from the Justice Department) of documents and records subpenaed from the oil firms.

. . . **Bills of particulars** from the Government, outlining the charges in more detail.

The Government's lone motion seeks a court order impounding the subpenaed oil-company documents.

Dismissal of criminal action is being sought by the oil companies on grounds the charges are vague, indefinite, and inconclusive. A previous motion for dismissal, attacking the makeup of the grand jury which returned the indictment, was denied by U. S. District Judge Albert V. Bryan of Alexandria (OGJ, Sept. 15, 1958, p. 118).

Streamlined procedure . . . Judge Savage is taking steps to speed up what ordinarily could be a long, drawn-out legal hassle.

He has requested an informal conference among attorneys on both sides after the hearing on the motions is concluded. The judge pointed out such procedure must be on a voluntary basis by both Government and defense counsel in criminal actions.

The conference might enable opposing attorneys to agree and stipulate to some points of the case to save on courtroom time.

It also could be determined whether all the parties would waive trial by jury and agree to a trial by the jurist, a move which would speed up the case.

Octanes Creep Up

slightly in 1958, but gains were the lowest in 7 years.

GASOLINE octane ratings for both premium and regular continued to climb in 1958, but the annual rate of increase was the lowest since the Korean War year of 1951.

Ethyl Corp.'s monthly nation-wide survey showed December average for premium at 98.8 research octane and regular at 91.5, the same as in November.

The December 1958 level for both grades is just 0.4 octane higher than December 1957. This slight gain is much lower than the average annual gain of 1.3 octanes for premium and 1.2 for regular during the 1952-57 period.

There are indications that the 1959 gain will be more in line with 1958. This year may see an increase of possibly 0.5 octane, and certainly not more than 0.7.

An interesting development in the 1958 octane picture was the big spurt on the West Coast. The December premium count in that region was 99.3, an increase of 1.8 over December 1957. This puts the West Coast premium level a half octane above the national average.

Bay Is Expanding

its refining and marketing operations in Deep South.

TWO DEVELOPMENTS last week indicate the determination of Tennessee Gas Transmission Co. to carve a bigger name for its Bay Petroleum Co. division in the oil world.

These were the developments:

. . . **Bay bought a chain** of 41 service stations in Louisiana, Mississippi, and Alabama from Gulf Coast Oil Co. Purchase price was not stated.

. . . **The company plans** to modernize its New Orleans refinery, increasing the capacity from 25,000 to 33,000 bbl. daily.

In the same deal with Gulf Coast, Bay acquired 14 transport tractors, 12 transport trailers, and a combination warehouse-truck maintenance facility located near the New Orleans refinery.

The stations, with 170 employes, will market under the "Bay" brand name instead of "Gulf Coast." The new properties consist of the portion of Gulf Coast Oil owned by Sam Paciera and the heirs of Tony Paciera, all of New Orleans.

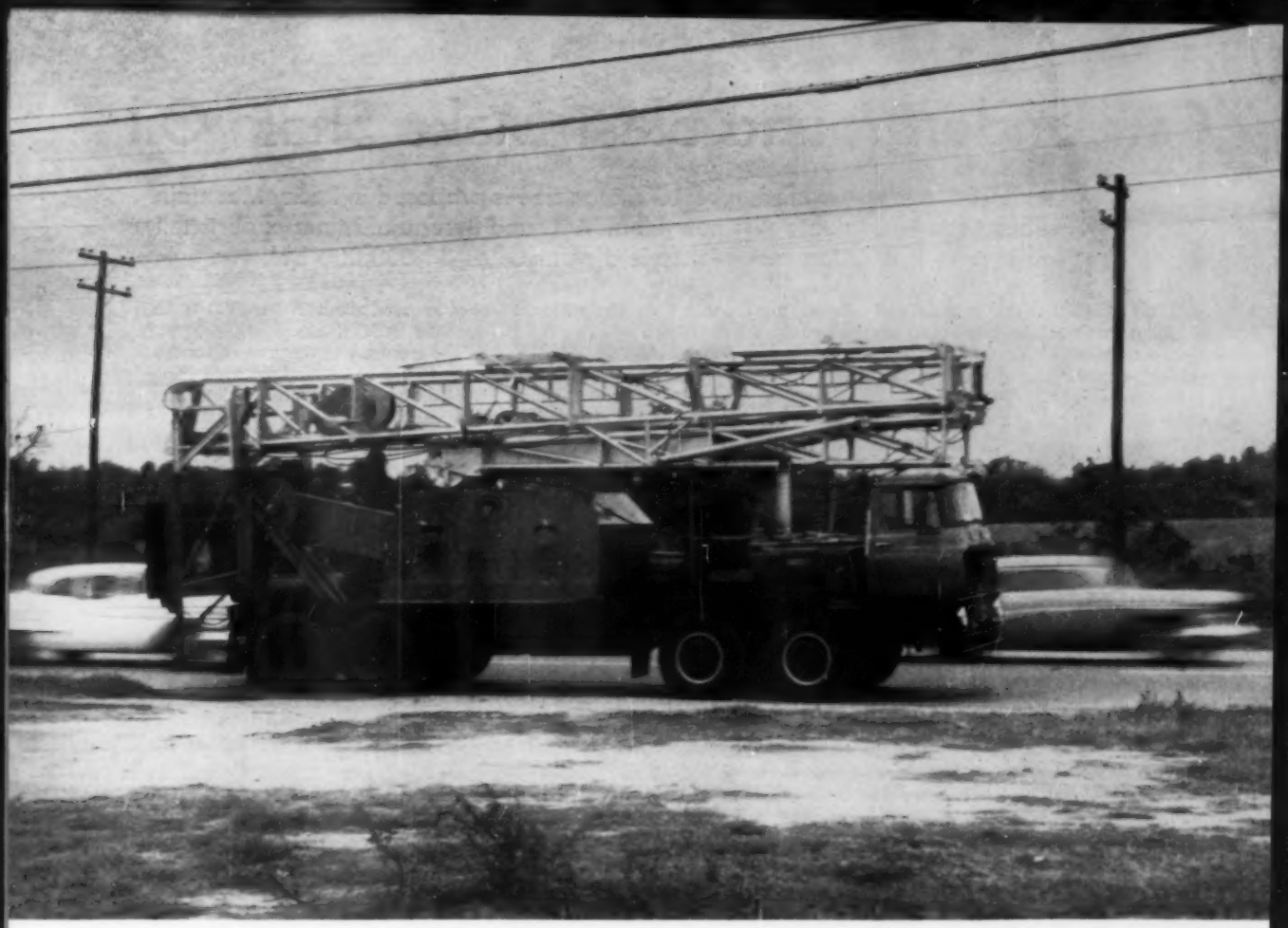
The modernizing program at the New Orleans refinery consists of three main parts:

. . . **Installation** of a 2,700-bbl.-per-day alkylation unit to produce high-quality gasoline.

. . . **Increasing capacity** of the plant's catalytic-cracking unit from 9,000 to 13,000 bbl. per day and providing alkylation feedstocks. Also, related gas-recovery facilities will be imported to increase propane recovery.

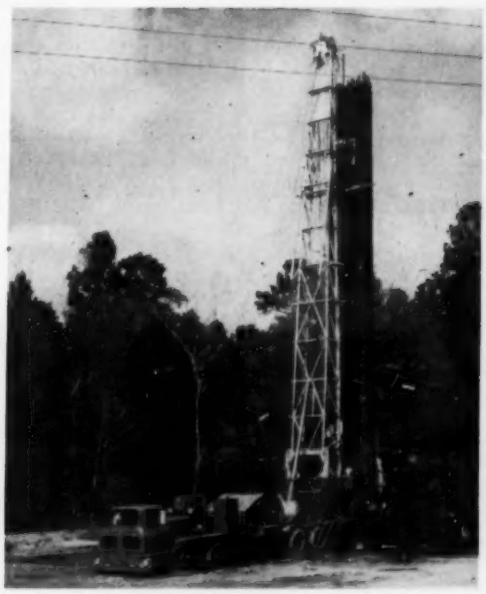
. . . **Installation** of a two-stage crude oil distillation unit, which will raise capacity to 33,000 bbl. per day and replace the crude unit now in use.

The expansion also includes construction of 200,000 bbl. of crude and product tankage and additional steam capacity.



Cooper "Licks" Highway Problems with a Completely Legal Doubles Rig

The Cooper model TC self propelled unit, equipped with a Cooper skytop for servicing the deepest wells, has licked the problems of moving a doubles rig over the highways. Lighter weights, axled right for your job, and legal dimensions add up to a truly portable machine that *costs less* than so called portable rigs. The Cooper model TC is easy to keep clean because it's uncluttered. It's rugged enough to withstand heavy oil field use. Get full details from a Cooper salesman or write Box 1890, Tulsa, Okla.



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Can Underground Blast Make Shale Oil

• "Pilot" nuclear explosion of 10-kiloton size is proposed in Rocky Mountain shale beds to evaluate this new idea. AEC and Bureau of Mines experts tell oil men a 1-megaton test might yield as much as 30,000,000 bbl.

THE OIL INDUSTRY was invited in Dallas last week to join in an experiment, which, if successful, could revolutionize the shale-oil business.

The experiment: A pilot nuclear blast followed by in situ combustion in the blast area in the tremendous oil shale deposits in the Rockies.

The object: To see if such a recovery method could be used on a large scale to produce economically the trillion-barrel shale oil reserve locked up in the fabulous Green River deposits spread over Colorado, Utah, and Wyoming.

The industry's partners in such a pilot project, if it participates, would be the Atomic Energy Commission and the Bureau of Mines.

It was these two agencies of the federal Government that called and conducted the Dallas conference.

None of the delegates indicated they wanted to jump into such a project immediately, but they certainly listened to what the government men had to say about the possibilities of using atomic energy to free the nation's vast shale-oil reserves. Conference attendance reached 175—much higher than had been anticipated.

Technicians of the AEC and Bureau of Mines are optimistic that the combination of nuclear explosion and in-place combustion can produce shale oil at prices competitive with crude.

The proposed test shot would be a small one—an atomic explosion equivalent to 10 kilotons of T.N.T. If an experiment should prove successful, however, these technicians see commercial use of much larger blasts —in the neighborhood of 1 megaton thermonuclear explosions.

Big recovery seen . . . They predict that the 10-kiloton test should free 15,000 bbl. of shale oil and 10,000,000 cu. ft. of gas just from the heat of the explosion. Along with this, enough oil shale should be crushed and broken so that the oil yield would be increased 150,000 bbl. via in situ combustion in the blast area.

The 1-megaton blast they estimate, would shatter 50,000,000 tons of shale at a depth of 3,000 ft. and would result in recovery of up to 30,000,000 bbl. of oil. This would compare with what now is generally considered a major oil field.

The oil recoveries are estimated figuring oil content of the shale at about 25 gal. of oil per ton. This is oil shale at its richest.

The 3,000-ft. depth would be sufficient to contain the explosion so that no radioactive gases or other materials could be released to the atmosphere.

The AEC and the Bureau of Mines base their estimates primarily on information gleaned from the 1.7-kiloton Rainier atomic shot fired underground in Nevada in September 1957.

The investigation, testing, and analysis of the Rainier blast was handled for the AEC under contract by the E. O. Lawrence Radiation Laboratory at Livermore, Calif., of the University of California.

This shot was exploded in the Oak Springs tuff, a volcanic rock. It produced about 200,000 tons of permeable broken rock and about 500,000 tons of crushed but relatively impermeable material.

The Rainier shot demonstrated, AEC says, that radioactive products of nuclear explosions can be completely contained underground. The fission products in the tuff formation were trapped in a highly insoluble fused rock.

The Green River oil shale, the technicians admit, is a tougher formation than the tuff. And an explosion of comparable size would not shatter as much shale. But the oil-recovery calculations, they say, take this into account.

The test shot . . . Specifically, the Bureau and the AEC propose the 10-kiloton shot be fired in Green River oil shale on Naval Oil Shale Reserve lands in the vicinity of Rifle, Colo., in the Piceance Creek basin area.

Exact location, if this site were finally chosen, would be in Section 35-5s-95w in Garfield County.

The Naval reserve covers a block of about 75 sq. miles. The reserve takes in part of the region's richest oil shale bed—known as the Mahogany ledge. This section would be the target.

The test shot would be fired in an area where a tunnel roughly 1,450 ft. long could be driven into the side of a cliff to reach the shale. There would be about 900 ft. of overburden.

Based on the Rainier shot, an explosion of the projected size in oil shale should crush and break the shale over an area about 200 to 300 ft. in diameter, AEC thinks.

The geometry of the zone of broken shale would be determined by drilling five core holes. The postshot exploration also would attempt to fix the extent and nature of fracturing, and to obtain oil and gas samples and cores for lab analysis.

The combustion phase . . . When the geometry of the broken-shale zone is known, project sponsors would be better able to devise an in situ combustion project to recover the oil from this zone.

Bureau of Mines experts feel that one of three methods to retort the shale in place as in a batch-type retort should prove feasible.

. . . Ignite shale at the top of the broken zone and withdraw shale oil at the bottom through conventional wells or slanted or horizontal shafts.

. . . Ignite shale at the bottom of the broken zone and produce oil through a well drilled from the surface to the top of the zone.

. . . Copy crude combustion drive wherein wells would be drilled to periphery of broken zone to withdraw the shale oil—the process involved in some experiments using fire floods in secondary recovery of petroleum.

Costs . . . The Government experts estimate costs of the proposed pilot project at about $1,200,000.

This excludes cost of fabricating, installing, and firing the nuclear device and of any preshot or postshot work done by AEC solely for its own use. The AEC would stand these costs.

The industry money would go for site selection, site preparation (including access roads and tunnel, postshot exploration (core holes and lab work), and the actual oil-recovery operation.

Site-selection expenses would be for studying geology, topography, ground water, stratigraphy, drainage problems; drilling one core hole; and legal activities such as preparing and executing agreements, and examining titles.

Contract terms . . . Sample contracts circulated by the government representatives call for oil companies which would participate to plunk down $500,000 in advance.

This would cover site selection and

Competitive?

preparation and postshot exploration. The sample contract contains an escape clause whereby the companies at this point could back out or continue and contribute another $700,000 to launch and operate the fire flood.

The Government and participating companies would share rights to the process if successful. The method, after being patented, would be made available to nonparticipating companies in the industry presumably under license and for a fee.

Pig in a poke? . . . As it turned out, the government technicians had considerable difficulty in convincing the oil scientists that it would be feasible for the industry to join in the project as proposed.

Dr. M. R. J. Wyllie, of Gulf Research & Development Co., Pittsburgh, put it this way: "I, and I believe most of us (industry), feel you are asking us to buy a pig in a poke."

The industry, Wyllie said, is being asked to spend $500,000 with absolutely no guarantee or concrete evidence that any oil at all can be produced in such an experiment.

The general industry feeling as sampled by the Journal seemed to be that the Government is asking oil companies to enter the project too early —that they should not be asked to foot the bill at least until after the postshot exploration.

As to physical aspects of the experiment, oil company delegates felt that government technicians have little data on which to predict success for such a project in oil shale. They doubt the wisdom of trying to predict results of a nuclear blast in oil shale from results of one in tuff.

They point out that a very large percentage of the blasted tuff at Rainier was left, according to AEC, either as an apparently impermeable clay-like material or in very large chunks. Whether combustion or underground retorting of either is possible is unknown and perhaps even doubtful.

Proposal flexible . . . Government technicians, however, insist that the government position and offer are flexible, at least, to some extent.

They want the industry's considered reaction to the proposal, its suggestions and comments, and counter proposals if it decides such are needed.

Anderson, however, pointed out that the bureau now is barred from spending money for major oil-shale projects and that AEC funds are limited and already earmarked. Indications also are, he said, that the commission can expect no budget increase this year.

PRIME PARTICIPANTS in Bureau of Mines-AEC atomic conference in Dallas were (left to right): Ellison C. Shute, manager of AEC's San Francisco operations office; Harold M. Thorne, director of petroleum research at the Bureau of Mines' petroleum research center at Laramie, Wyo., who made most of the shale oil-recovery estimates; C. E. Violet, physicist of the University of California's E. O. Lawrence Radiation Laboratory at Livermore, Calif.; Carl C. Anderson, chief petroleum engineer of the Bureau of Mines and chairman of the Dallas conference; and Roland F. Herbst, Lawrence Radiation Lab physicist.

Where from here? . . . Upshot of the conference was the decision, satisfactory to both government and industry, that the oil-shale project be pursued according to this plan:

The Bureau of Mines within the next few weeks will send out a form letter to all companies participating in the conference. The questionnaire will solicit each company's:

. . . Reaction to proposal by the Government plus its comments and suggestions.

. . . Feeling as to desirability, as suggested by several oil company delegates, of running a small thermal-recovery project in oil shale near the surface to check efficiency of a thermal drive in shale broken in large chunks. This could be done at small cost prior to trying the nuclear shot. The bureau will also ask if oil firms would be willing to contribute to the nominal cost of such a small thermal test.

. . . Opinion on need for a committee, formed of representatives of both government and industry, to further the nuclear project.

The bureau will analyze the returned questionnaires, pass this analysis back to the companies, and, if the analysis warrants, call a second conference. Machinery would be set up at this conference to push the project.

Industry interested . . . Though industry appears to feel generally that the government proposal isn't the best way to pursue the experiment, it is nevertheless intrigued with the idea.

The shale-oil reserves at stake are tremendous. Present methods of mining and retorting oil shale aren't economical even in shallow deposits and are impossible in the deeper ones.

The nuclear-fire flood method could reach the deepest. And, if government estimates should prove accurate, produce shale oil at about $1 a barrel.

The method's potential, if this were proved, would be tremendous.

The industry may well decide to take the gamble.

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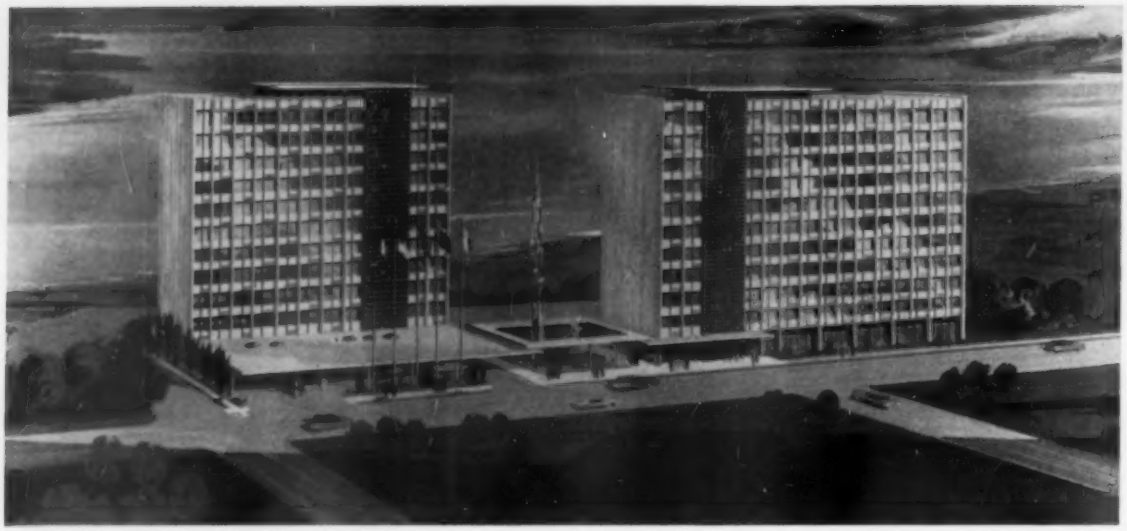


Alaska's Busy Oil Capital to Get New Buildings

A TEXAS OIL MAN and an Alaska real-estate developer will join hands to erect a hotel (left in photo) and an office building (right) at Anchorage, oil center of the new state.

The twin buildings, each 11 stories high, will cost $10 million. Michel T. Halbouty, Houston independent who has leases in Alaska, and Walter J. Hickel, Anchorage real-estate man, will start construction of the two buildings this spring. They expect to have them ready for occupancy by the spring of 1960.

The 460 by 140-ft. building site in downtown Anchorage is on a bluff overlooking Cook Inlet. The office building will have more than 130,000 sq. ft. of space and the hotel 200 rooms. Basement parking will accommodate 300 cars. The office building will be known as the Hickel-Halbouty Building and the hotel as Captain Cook Hotel.

PROCESSING BRIEFS . . .

The world's first UOP Butamer unit will be installed at California Standard's big Richmond refinery. The unit will produce about 2,000 bbl. of isobutane daily by isomerization of normal butane. It will use a fixed-bed, noble metal-containing catalyst having high activity. Isomerization reaction is carried out in a hydrogen atmosphere, using moderate temperature and pressure. Volumetric efficiency is substantially 100%.

Standard of California is making the detailed engineering design for the unit, which will be built by Fluor Corp. The unit is scheduled for completion in June.

Work will start in March on SunOlin Chemical Co.'s $11-million area plant at Claymont, Del., near Sun Oil's Marcus Hook, Pa., refinery. The plant with capacity of 73,000 tons annually, will be the fourth in the U. S. to use the Fauser-Montecatini process in which ammonia and carbon dioxide are converted to urea. M. W. Kellogg Co. has contract for the plant, steam methane reformer and auxiliary facilities. Completion is expected before the end of the year. SunOlin is a jointly owned subsidiary of Sun and Olin Mathieson Chemical Corp.

The name of Sinclair Chemicals, Inc., has been changed to Sinclair Petrochemicals, Inc. All personnel, offices, and operations remain unchanged. The company is a wholly owned subsidiary of Sinclair Oil Corp.

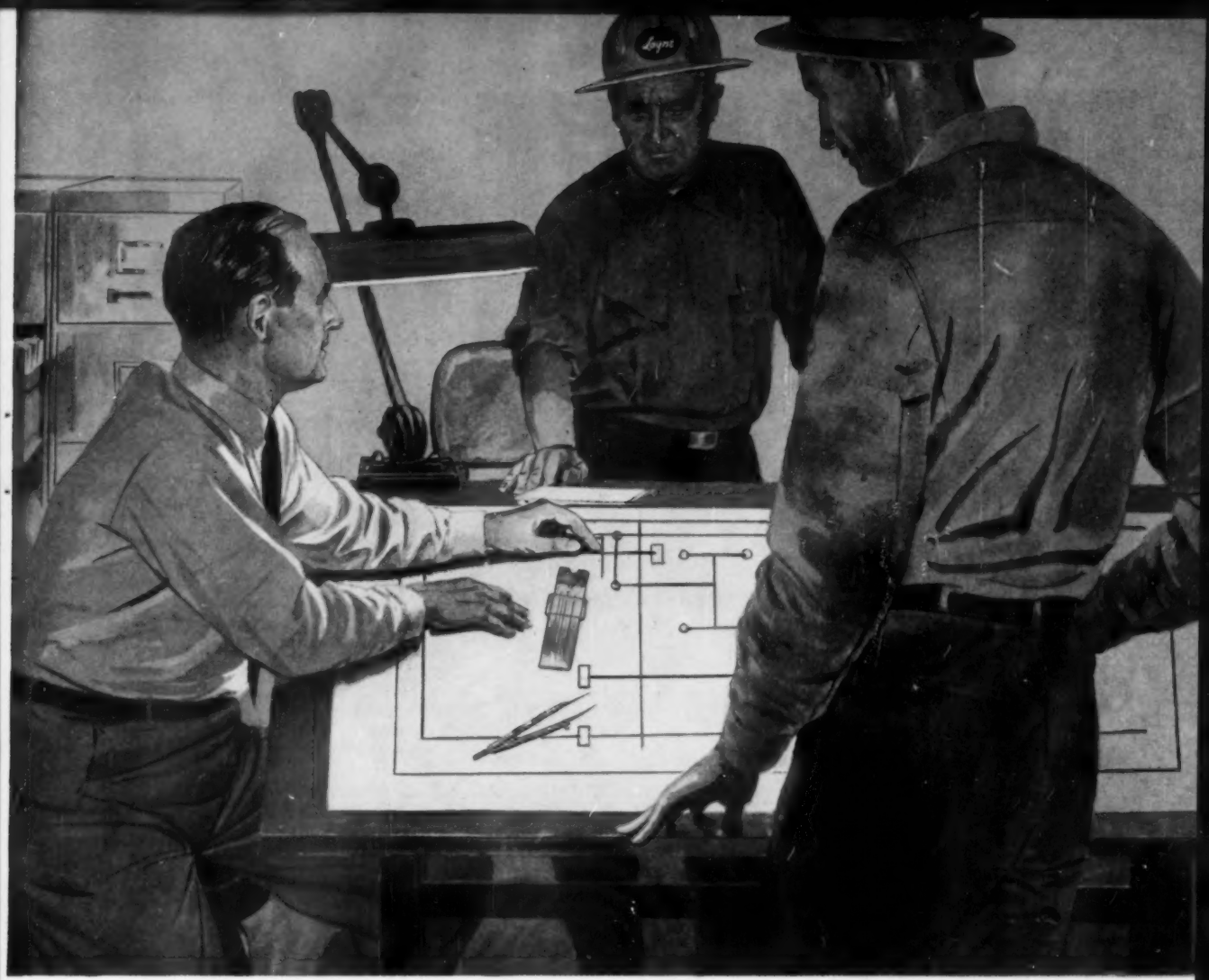
American Chemical Corp. will build a $7.5-million petrochemical plant next to Richfield Oil's refinery at Watson, Calif. Raw materials for the plant will be supplied by Richfield and neighboring Stauffer Chemical plant. American Chemical is owned jointly by Richfield and Stauffer. Major products of the new plant include ethyl chloride, ethylene dichloride, and vinyl-chloride monomer. Construction is slated to start this month with completion set for January 1960. The construction contract was awarded to C. F. Braun & Co.

A basic research project to explore methods of making hydrocarbon liquid fuels from coal will be carried out jointly by Ohio Standard and Consolidated Coal Co. Ohio Standard soon will begin work on the project in its Cleveland laboratories. Consolidated has been doing research in this field for some time at its Library, Pa., laboratories.

Also for Refiners . . .

IN THE NEWS: OCAW steps up moves threatening strike in oil industry (p. 47) . . . Move to reduce imports of residual oil starts early in new 86th Congress (p. 48) . . . Federal judge holds up start of Commerce Oil's new Rhode Island refinery (p. 48) . . . Aggressive promotion is D-X Sunray's formula for selling more gasoline in a tight market (p. 52) . . . Gasoline octanes went up in 1958 but at lowest rate since 1951 (p. 56) . . . Bay Petroleum is expanding its refining and marketing operations in Deep South (p. 56) . . .

PLUS THIS TECHNICAL REPORT: How to select and specify process equipment (p. 92).



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CORES AND CUTTINGS from 55,000 wells are easy to find as . . .

Geologists Probe Big Library

. . . for valuable subsurface data. Texas collection includes 4 million cores and samples, with emphasis on wildcats.

NEED some seemingly unavailable subsurface dope on a dormant but promising exploratory area in Texas?

You may be missing a bet if you don't try the huge well sample and core library operated by Texas University's Bureau of Economic Geology at Balcones Research Center, Austin.

Geologists are homing in on this geological bonanza in growing numbers to seek, and often find, information they could get nowhere else.

The library is believed to be the largest public collection of its kind in the U. S. It boasts more than 4,000,000 cores and samples from more than 55,000 oil, gas, and water wells in every section of the state.

Weighing more than 400 tons, the collection contains cores from roughly 20,000 wells and cutting samples from over 38,500 holes. Together, they represent geologic sections measuring about 20,000 miles. They cover 11,050 sq. ft. of floor space and occupy 16,000 cu. ft. of shelf space.

Emphasis in collecting the cores and cuttings is on wildcat wells, with library staffers carefully avoiding duplication in choice of samples filed. Besides the permanent files, duplicate samples are kept and may be washed, dissolved in acid, sliced into thin sections, and in other ways analyzed by library users. Facilities for analysis are available at the library.

How they're filed . . . The library uses a simple, easily accessible system for filing and locating its samples.

For instance, as well samples come in, usually as donations from oil companies, they are processed and given a serial number. The sample then is divided into duplicate sets. One set serves as a permanent lithologic record of the well. It is placed in a 1-dr. glass bottle fitted with an aluminum cap. This set may be examined but not altered.

The duplicate set is stored in a 3 by 5-in. manila envelope. Each bottle or envelope carries a label with its serial number and the depth and length of formation the sample represents.

A serial-number card is filled out for each well filed. The card lists the county, operator, fee owner, county and survey locations, sample range, and the name of the sample contributor. Each well also is cross-indexed according to county, operator, and fee owner.

The permanent bott'ed samples are filed in metal boxes. Each box contains 10 drawers. And each drawer holds 110 samples.

The duplicate samples in manila envelopes are stored in boxes about 1 ft. long—each holding about 30 samples.

No permanent file for cores has yet been set up, but this will be done in the near future.

Index available . . . The library has published a general index of all Texas wells represented in the collection.

The index, now attracting wide industry interest, lists each well by county and, within each county, alphabetically by operator and fee owner. The sample depth range also is noted.

Operators cooperate . . . As the library has grown it has become more valuable to Texas oil operators.

Most operators in the state now are aware of the library. They remember this when lack of space forces them to dispose of accumulated cores and cuttings.

The library recently, for instance, accepted two trailer truck loads of cutting samples representing 1,800 wells drilled by Phillips Petroleum Co. in North Texas.

Philip S. Morey, geologist in charge of the library (photo), and assistants went to Phillips' Wichita Falls warehouse to load the trucks. The resulting sorting and filing job at the library extended from October 9 to December 4.

Gulf Oil Corp. recently helped out with a tremendous store of cores from Crane, Winkler, and other West Texas counties. Morey and assistants took off for West Texas, culled desired cores from the huge supply, and took two truck loads totaling more than 60,000 lb. back to the library at Austin.

Such industry response threatens to strain to bursting the storage space available at the library. But Morey and his staff aren't complaining. They hope soon to augment the present three-story brick building with an adjoining structure as soon as funds are available to revamp it.

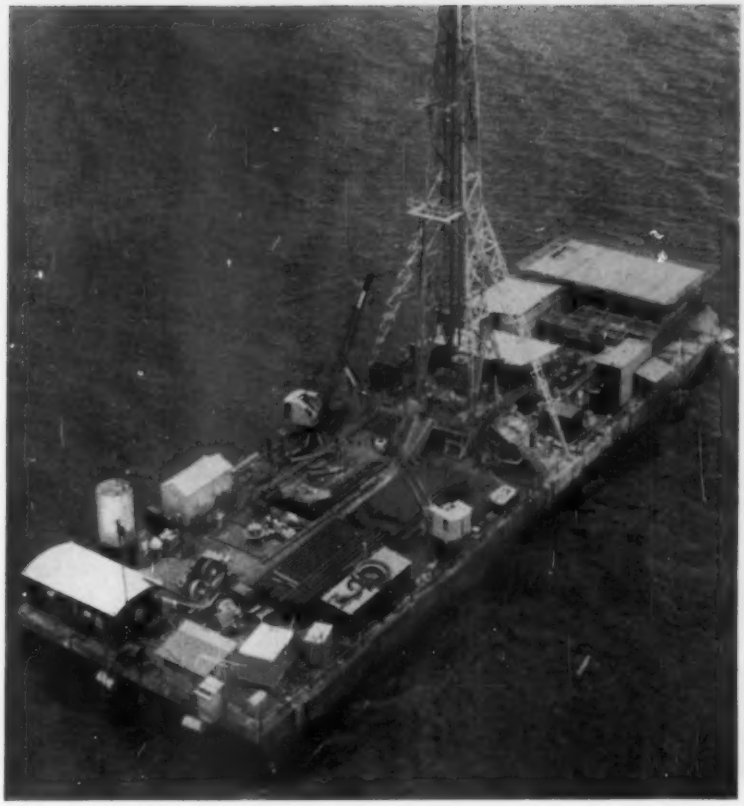
UOP Stock Sale Approved

THE LAST legal barrier to the sale of Universal Oil Products Co. stock was removed last week when Jacob Markowitz, New York Supreme Court justice, approved the referee's recommendation.

Universal's securities will be sold to Universal Oil Processes, Inc., a new company organized by the managing underwriters, Lehman Brothers; Smith, Barney & Co.; and Merrill Lynch, Pierce, Fenner & Smith.

After the sale, name of Universal Processes will be changed to Universal Oil Products Co. The company was organized to obtain tax benefits approved by the Government.

Markowitz will ho'd another hearing prior to the sale to set the price of the stock.



New Floating Drilling Barge

. . . does successful year's work off Trinidad west coast. Problems whipped, platform may tackle completion tests.

A LOT IS YET to be learned about drilling offshore wells from floating platforms, but an operator with a year's experience behind it in the Gulf of Paria has made progress where it counts—the pocketbook.

Dominion Oil, Ltd., has been drilling wildcats off the west coast of Trinidad for more than a year using a floating platform with steadily increasing efficiency. The California Standard subsidiary says that while speed of drilling "has not been spectacular in comparison with conventional methods, drilling costs have now been reduced until they are comparable with land drilling costs."

The company adds that several holes have broken widely advertised depth records for this type of drilling. One well reached 10,814 ft. before being abandoned for "geological reasons," and the rig is currently drilling a 9⅞-in. hole below 9,000 ft.

The background . . . Dominion Oil in June 1957 agreed on the program with Socal. The decision was based on the parent company's success with the "Western Explorer" off the coast of California. This justified the use of a similar vessel for drilling medium depth exploratory slim holes in the Gulf of Paria.

Offshore Co. of Baton Rouge was selected as drilling contractor. Its 240 ft. by 72 ft., by 15 ft. barge was equipped with six 6,000-lb. Danforth anchors, two cranes, hose reels, and constant tension devices for the submarine guide lines.

A 12-ft. diameter well was cut in the center of the barge. After the barge was towed from New Orleans to Trinidad, a National 55 consolidated rig was installed.

A 131-ft. Lee C. Moore mast was shortened to 100 ft., and provision made to lay down 3½-in. drill pipe in doubles. A Gimballed rotary bushing was used. Block guide cables were installed, and the barge was ready for its first location in September 1957. Shaffer submarine drilling equipment has been used since the beginning of the program.

What was learned . . . The drilling program and equipment have been constantly modified and improved to suit conditions in the Gulf of Paria.

The mast has been lengthened to the original 131 ft., and reinforced in order to stand back all drill pipe in trebles. Conventional-size holes are now being drilled with 4½-in. drill pipe.

A drill nipple has been added with necessary motion compensating devices. Block guide rails have replaced the original cables. Constant tension devices are rarely used, but they still are installed.

Holes have been drilled in water depths ranging from 36 ft. to 106 ft., and weather conditions have ranged from dead calm to 14-ft. swells. Larger swells are extremely rare and drilling is not attempted during these periods. Other operations can continue, however. Dominion hopes to be able to drill in 10 ft. swells soon by using additional bumper subs in the drill string, and installing a recently designed drilling nipple.

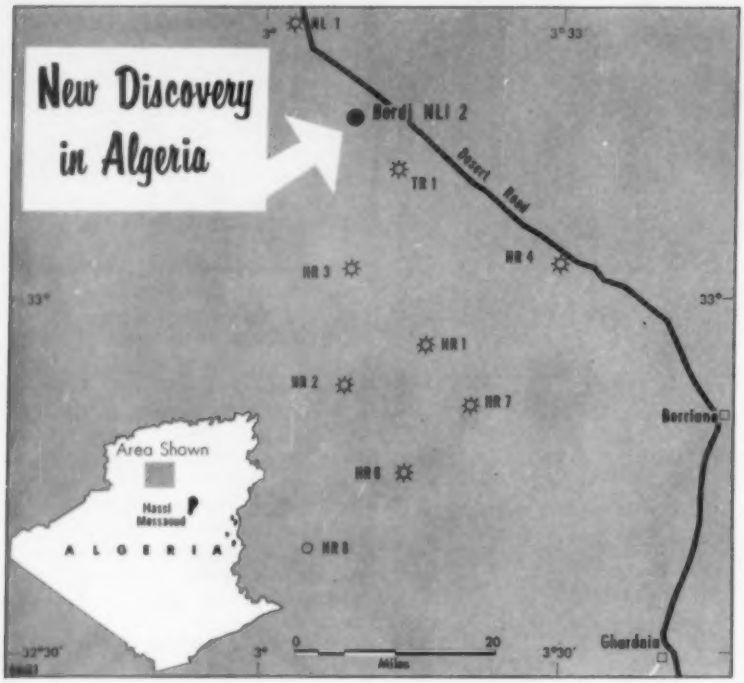
The constant movement of the barge and drilling equipment affects all operations to some extent. A self-actuating compensating device has been installed to keep wire line tools stationary with respect to the hole.

Part of the success has been attributed to the engineering ingenuity displayed by Dominion Oil and Offshore Co. in solving problems that have been encountered. Some special tools, such as tension-operated outside cutters, cannot be used. Tool selection must always be made with complications due to movement taken into consideration.

Where know-how stands . . . Dominion has not yet had a chance to test or complete a well, but they are ready to tackle the problem.

Operating personnel feel that well-testing operations can be carried out simply and successfully. Completion of a well for production is expected to be tougher, and new and varied complications are anticipated.

The completion problems have not yet been solved to the point that a floating platform could be satisfactorily used to drill development wells.



Another Sahara Strike Made

. . . by SN Repal near huge Hassi er R'Mel wet-gas field. Well flows 50 bbl. an hour from Triassic at 8,200 ft.

THE FRENCH last week added another promising oil discovery to a growing list of fields in Algeria's Sahara desert region.

The latest find is Bordj NLI 2, on the northern flank of a mammoth wet-gas field being developed by SN Repal. The new well tested at the rate of 50 bbl. an hour from a Triassic sandstone found at 8,200 ft. The company set 9⅝-in. casing at 7,750 ft. 2 weeks earlier and started coring operations below that depth.

The new oil find is just about 6 miles northwest of the northernmost gas well so far completed at Hassi er R'Mel. Seven of the wet-gas producers have been completed in a field that is at least 30 miles long from southwest to northeast and about 18 miles wide.

The latest well, typical of the development so far, is HR7 which tested more than 55,000,000 cu. ft. of gas daily. The gas producers have all been completed in a Cambro-Ordovician pay found at about 7,500 ft.

The Hassi er R'Mel field is about 190 miles to the northwest of Hassi Messaoud.

Atlantic Joins Drilexco Firm

. . . for exploratory work in Bolivia on 1,250,000-acre tract east of Cochabamba. Gulf, Chaco tests under way.

ATLANTIC Refining Co. has taken a 1-year option on an 80% interest in 1,250,000 acres of concessions in Bolivia held by Bolivia Petroleum Corp., a wholly owned subsidiary of Drilling & Exploration Co., Dallas.

The Drilexco subsidiary started its exploratory work on the acreage 6 months ago, shortly after it was granted the six concessions in Zone 1 of Bolivia's prospective oil areas.

Atlantic plans an extensive program to supplement the work already done. It will consist of photo-geological studies to be followed by field work after the beginning of the dry season about April 1.

Atlantic will earn an 80% interest in the acreage by drilling one wildcat if it decides to exercise the option. Atlantic will foot the entire drilling cost for the first well.

The Drilexco acreage is in the region to the east of Cochabamba where at least half a dozen companies have concessions.

Tests drilling . . . The new farmout is typical of renewed interest in Bolivia since the country modified its oil law to permit oil exploration by foreign capital.

The first deep test under the new look in Bolivia was abandoned by Bolivian Gulf Oil Co. at 11,600 ft. The first test was Mandeyapecua 1, about 18 miles east of Boyuibe, the northern terminus of a railroad which runs into Bolivia from Argentina. The region is in Bolivia's southeastern zone reserved to Yacimientos Petroliferos Fiscales Bolivianos, the government oil agency.

Gulf is now drilling ahead on Mandeyapecua 2, less than a mile to the east of the first hole. The objective is the Tupambi sandstone above a thrust fault at about 6,000 ft. The company hopes to find this zone structurally higher than in the first well. The Tupambi was a thick zone with good porosity in the first well, but carried water.

The structure being tested is believed to be 38 miles long and from 8 to 10 miles wide.

Other Bolivian tests are being drilled by Chaco Petroleum, a subsidiary of Tennessee Gas Transmission Co., and at least two new deep tests are being planned for YPFB and for Bolivian Oil Co. by Big Chief Drilling Co. crews (OGJ, Dec. 15, 1958, p. 86).

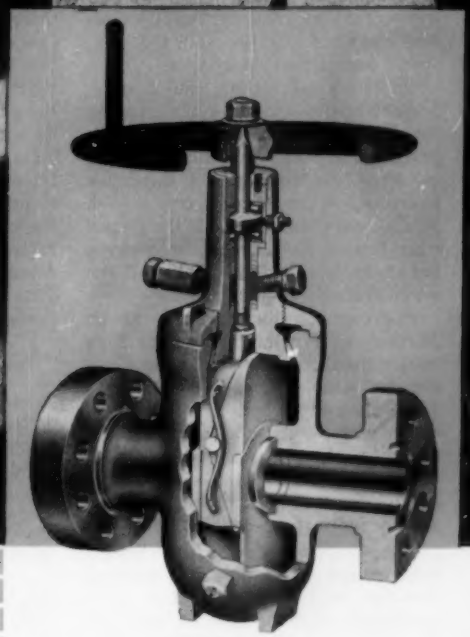
Piers at Amuay Enlarged

PIER FACILITIES at Amuay refinery will be able to load 1 million barrels daily when Creole Petroleum completes a $7.3-million expansion and modernization program.

The project will be completed soon when three smaller piers are lengthened by 200 ft. to 870 ft. A new 1,017-ft. pier capable of loading 40,000 bbl. per hour through hydraulically-operated loading lines was opened last year.

The new pier can handle two 60,000-ton supertankers at the same time. The harbor has already been dredged to 41 ft. to accommodate ships of this class.

Capacity of the big Venezuelan refinery is 329,000 bbl. daily. The record movement of products from the pier was 658,000 bbl. daily in December 1956, at the height of the Suez crisis.



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Russia's Oil Exports Are on the Rise

• Soviets not a serious threat yet, but continue to plug away for markets in many areas.

IT'S NO SECRET that Russia wants to become a serious competitor in free-world oil markets, and it has now released figures showing that spadework is well under way.

In terms of today's oil market, present Soviet exports are a drop in the bucket. But shipments of crude, products, and equipment are growing by leaps and bounds. Oil shipments to free-world countries are now as high as they were back in 1932, the record year before Russia's export business caved in under the weight of the world-wide depression.

Representatives from the Soviet Ministry of Foreign Trade have been busier than ever before the past few months. Among the deals which have come close to home is a barter agreement with Brazil, 450,000 tons of crude in return for an equal value of cocoa. Argentina has accepted an offer for $100 million worth of credits to buy industry equipment.

For years, however, the Soviets have quietly plugged away at building foreign markets. They have now published details of their 1957 foreign oil trade. The Russians report:

USSR's Equipment Customers in 1957

	Drilling rigs	pumps	Turbo-drills	Bits	Pumping jacks	Seismic stations	Pipe* (000 tons)
Albania	13	164	29	1,260	31	...	8.4
Austria	...	...	...	...	...	...	4.9
Bulgaria	13	...	...	806	...	...	8.9
Burma	...	...	...	...	...	...	1.7
China†	146	44	125	5,809	19	...	26.0
Czechoslovakia	56	...	9	...	...	...	1.3
East Germany	22	...	...	911	...	...	34.6
Egypt	Not listed by item. Total value (excluding pipe) $134,000.						4.1
Hungary	Not listed by item. Total value (excluding pipe) $1.1 million						13.4
Iceland	...	...	...	...	...	...	1.9
India	2	...	...	...	...	...	.9
Lebanon	...	...	...	...	...	...	.3
Mongolia	7	206	...	570	...	...	2.0
North Korea	31	14	...	...	...	...	3.3
Poland	5	...	...	100	...	...	.9
Rumania	6	...	...	470	...	13	93.4
Syria	...	...	...	...	...	...	.3
Turkey	...	...	...	...	...	...	.1
Totals	**301**	**428**	**163**	**9,926**	**50**	**13**	**206.4**

*Includes tubing. †Includes 17 large, complete rigs.
Note: Russian Ministry of Foreign Trade omits some items from country-by-country listings which are included in world totals cited in text of story.

... **A 47% per year increase** in oil exports has been averaged from 1951 through 1957.

... **More than twice** as much crude was sold on the world market in 1957 as in 1955. Sales of products rose 25% from 1956 to 1957.

... **Oil-equipment exports,** excluding pipe and tubing, amounted to a comparatively small $11.8 million. But the Soviet's machine-export agency is pushing sales of items which are even in short supply in Russia.

Russia exported 273,000 bbl. daily

Russian Oil Trade During 1957

(Thousands of bbl.)

	EXPORTS		IMPORTS			EXPORTS		IMPORTS	
	Products	Crude	Products	Crude		Products	Crude	Products	Crude
Afghanistan	240	...	...	...	Italy	555	3,096	...	...
Albania	34	...	816	1,507	Lebanon	79	...	...	...
Algeria	1,209	...	...	...	Mongolia	543	...	34	...
Austria	8	...	...	8,172	Morocco	242	...	...	...
Belgium	5	...	...	...	Netherlands	1	...	...	...
Bulgaria	2,766	...	...	...	North Korea	1,306	...	...	...
China	10,339	2,766	...	...	North Vietnam	340	...	...	...
Czechoslovakia	749	8,977	...	...	Norway	1,067	...	...	...
Denmark	165	...	...	...	Poland	5,050	4,603	4	...
East Germany	27	7,594	1,533	...	Rumania	11	...	18,773	...
Egypt	5,483	2,313	...	...	Sweden	3,900	...	...	...
England	417	...	...	...	Switzerland	935	...	...	...
Finland	7,564	...	...	...	Syria	220	...	...	...
France	1,668	2,339	...	...	Turkey	34	...	...	...
Greece	2,199	...	...	...	West Germany	5,423	...	...	...
Hungary	446	6,683	188	...	Yugoslavia	112	2,838	...	...
Iceland	2,180	...	...	...					
Iran	2	...	...	...	**Totals**	**55,328**	**41,209**	**21,348**	**9,679**

Note: Russian Ministry of Foreign Trade omits small amount of refined products and crude exports in country-by-country listings which is included in world totals cited in text.

in crude and products in 1957. Of this amount, 119,000 bbl. daily was shipped to free-world countries, and the rest to Soviet-bloc nations. (Figures converted from metric tons on the basis of 7.27 bbl. per ton.)

Crude sales were up to 118,000 bbl. daily from 78,000 bbl. daily in 1956. Products exports rose to 155,000 bbl. daily in the same period.

The chief crude customers were Czechoslovakia, East Germany, Hungary, Poland, and Italy. Largest buyers of products were, in order, Red China, Finland, Egypt, West Germany, Poland, and Sweden.

Products shipments included 34,000 bbl. daily of gasoline, 18,000 bbl. daily of kerosine, 54,000 bbl. daily of diesel oil, 44,000 bbl. daily of fuel oil, and 4,000 bbl. daily of lubricating oil and grease. Other shipments include 17,300 tons of asphalt, and 11,300 tons of paraffin.

Oil-equipment sales in 1957 rose to 118 million rubles, or $29.5 million at the official 4-1 exchange rate. Some experts say a 10-1 exchange rate is more realistic, putting the worth of equipment closer to $11.8 million.

But either way, the Russians say they sold 26 large rigs and 326 light ones, along with 210 turbodrills, 46 cementing units, 11,400 bits, 50 pumping jacks, 468 pumps, and 16 seismic and 51 well-logging outfits. Exports of pipe, tubing, and fittings rose to nearly $45 million at the official rate of exchange.

Red China bought almost half of the equipment. Other large customers were Czechoslovakia, Hungary, and Albania.

Competitive potential . . . How soon and how great a competitive challenge Soviet oil will be is one of the free-world industry's major long-range questions.

Many western oil men feel the threat is still quite far off, except in special markets where Russia wants to move oil for political reasons.

Russia at least for a few years will probably be limited in export potential to the free world by its own increasing demand. Red China will also sop up a lot of oil as its industry grows.

Other observers believe Russia will be capable of exporting up to 1 million barrels daily in 5 to 10 years (OGJ, Aug. 25, 1958, p. 62). But total free-world demand is expected to hit close to 30 million barrels daily by 1967 (OGJ, Dec. 15, 1958, p. 74). This makes the potential 1 million barrels daily from Russia look less dangerous than it would if it were on the market today.

Australian Hunt Picking Up

. . . with agreement for three-company exploration program on 110,000 sq. miles. Outlay may top $10 million.

THE OIL SEARCH in Australia is due a large shot in the arm.

Vacuum Oil Co. and others have pledged to spend large amounts of capital to explore part of the huge Delhi-Santos spread in South Australia and Queensland for an interest in the concession.

Joining Delhi Australian Petroleum, Ltd., and Santos, Ltd., in the search is Frome Broken Hill Pty., Ltd. This is a group composed of Vacuum Oil Co. Pty., Ltd., a wholly owned subsidiary of Standard Vacuum Oil Co. of New York; BP Exploration Co., Ltd.; Consolidated Zinc Corp.; Interstate Oil, Ltd.; and American Metal Climax Co.

The preliminary agreement, announced by Delhi Australian president, J. L. Sewell, in Dallas, binds Delhi and the Frome group to spend $2,045,000 in 2 years (OGJ, Dec. 22, 1958, p. 55). The money will be spent in exploration and drilling in an area covering 110,000 sq. miles in the South Australia-Queensland corner region. It will pay for drilling three wells, including a deep test to 14,000 ft.

The 2-year cash outlay may be swelled substantially, if, as expected, the Australian Government comes through with subsidies toward the cost of drilling.

May spend more . . . The Frome group reserves the right to drop out of the picture after the initial 2 years.

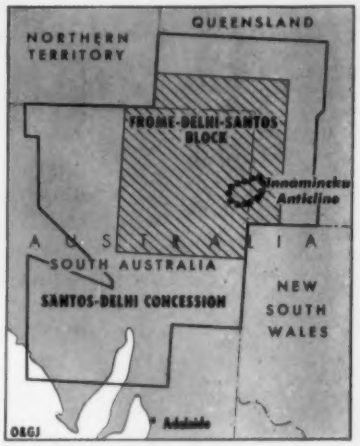
If it decides to continue, however, terms of the agreement call for added expenditures in the next 3 years which would hike the total exploration investment to roughly $10,700,000 by the end of 1963.

Here, again, government subsidies likely would boost the total outlay.

Though various interests in the concession under the new agreement were not disclosed by Delhi, they are understood by the Journal to be as follows: Frome group, 50%; Delhi Australian, 25%; and Santos, 25%.

Acreage reserved . . . The contract with the Frome group, expected to be approved by the two state governments, does not affect the remainder of the Santos-Delhi concession.

The two firms still hold exploration licenses on 157,000 sq. miles in the Great Artesian basin of South Australia and Queensland. The bulk of the remaining acreage lies west, southwest, and south of the lands involved in the Frome deal.



The Frome - Delhi - Santos block, however, dies include the Innamincka area in northeast South Australia and southeast Queensland where Delhi-Santos have staked location for a 14,000-ft. wildcat, their first (OGJ, Dec. 15, 1958, p. 89).

Delhi already has shipped casing and other supplies to Australia for this well. The wildcat is on an east-west trending anticline about 40 miles long by 30 miles wide.

Joining with Sewell in announcing the agreement with the Frome group was John Bonython, chairman of the board of Santos. Heading negotiations for the Frome group was Harry W. McCobb, senior vice president of Standard Vacuum.

Another deal made . . . Another company has joined the growing exploration play in Australia's Great Artesian basin.

Santiago Petroleum Corp. has acquired 75% interest in concessions covering 3,200,000 acres in Queensland. The acreage lies about 700 miles northwest of Brisbane.

The remaining 25% interest is held by Central Queensland Petroleum, Ltd., an Australian company.

Santiago, wholly-owned by Pan-Israel Oil Co. and Israel Mediterranean Petroleum, has also filed applications for another 22,400,000 acres in Central Queensland province. This area lies in the Great Artesian basin, between Longreach and Roma in central Queensland. Santiago's interest in these lands would be 100%.

Congrats and $25 to J. E. ROBERTS, Sohio P. L. Co., 7438 Forsyth, St. Louis, Missouri.

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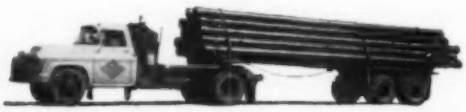
The big Lone Star Steel plant is busy 'round the clock . . . and Lone Star API quality is always under complete control from Lone Star-owned ore mines to finished pipe. Fully normalized, of course.



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▶▶▶ Technology—Operation

Automatic computation speeds pipeline-investment analysis

The application of automatic computation to economic analysis of crude-oil-pipeline investment has proved to be very practical. The computational work covers the basic design of a projected pipeline and estimation of construction and annual operating costs. These data are then used to develop financial information for evaluation of the proposed investment. Final output data are cash outlay and receipt schedules, payout period, and investment yield.

BY T. R. YOUNG
Engineer, Shell Pipe Line Corp.

THE PROBLEM of pipeline-investment analysis for proposed new facilities is inherently an active one as crude-oil deposits are subject to eventual depletion, as are all mineral reserves, necessitating active exploration for new reserves.

New discoveries of oil deposits demand pipeline facilities for transportation to refining centers. The process is continual and gives rise to a constant evaluation of projected pipeline facilities to serve the newly discovered oil reserves.

The task is further complicated in that the origin and destination of the proposed pipeline are not always known prior to economic study. A single oil discovery is often followed by subsequent discoveries in adjacent localities. It is usually possible for the geologist to indicate the regional extent of such possible future discoveries.

Presented at ASME Petroleum Mechanical Engineering Conference, Denver.

This information must be considered as it is desirable to maximize the likelihood of economic service for possible later discoveries. This situation leads to the study of alternative "origins" for the pipeline. Similarly, the destination of the pipeline may be subject to question as the profitability of crude delivered to different refining centers varies.

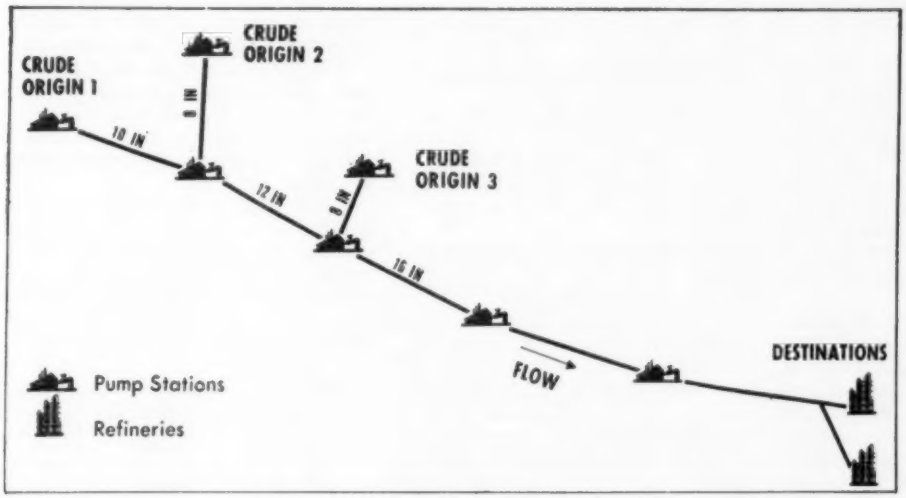
Representative Pipeline System

A sketch of a representative pipeline system is given in Fig. 1 showing multiple points of crude receipt (oil fields) and multiple destinations. Variation will usually occur in line diameter and unit costs in different segments of the system.

Aside from the origin and destination of the proposed line, the primary variable is the amount of oil to be pumped through the line. The anticipated line throughput is basic to the economy of the line as it determines the size of line required and the revenue to be generated.

In addition to various possible assumptions regarding throughput, assumptions must be made for unit costs of construction and operation, line route, crude physical properties, property-tax rate, interest rate for borrowed capital, amount and repayment schedule for borrowed capital, and for other parameters.

An analysis of a proposed pipeline usually will include the basic design of the line, estimation of the capital and annual operating costs for the system, and computation of critical financial data for the project. Finan-



ILLUSTRATIVE pipeline system showing multiple points of crude receipt (oil fields) and multiple destinations. Variation will usually occur in line diameter and unit costs in different segments of the system. Fig. 1.

cial data of principal interest are capital outlay, cash return, payout period, and yield on investment. It is often desirable to compute the data for each year of the projected life of the proposed line.

As the computations outlined demand weeks of manual labor, the stored program computer has been used to shorten the study time. A number of programs have been written for the computer to handle different portions of the computation. Basically, the work is divided into pipeline design, capital and manual operating-cost estimates, and financial computation. Wherever practicable, the output from one program is coupled with the subsequent program by common punched-card format.

Design calculations . . . Normal input to the design program includes a physical description of the proposed pipeline in terms of length, terminal elevations, assumed diameter, crude properties, and range of line throughput values. In addition, values for pump and motor efficiencies, maximum permissible line pressure, and spare power (expressed as a multiplier for the computed brake required) are also read by the computer.

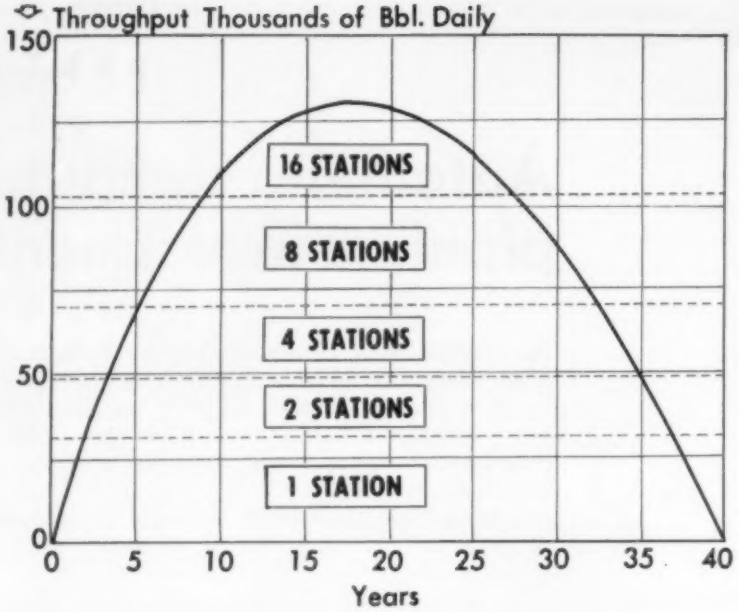
Output data are the number of pumping stations required in each segment of the system and the required power per station at each throughput level.

In a multiyear study, pumping stations will be added as line throughput increases over the years. Such expansion of line capacity will occur according to one of several patterns. As stations are spaced at equal distance, assuming linear change of elevation with distance, the number of stations at successive expansion stages may be, alternatively:

(a) 1, 2, 4, 8, 16, etc.
(b) 1, 3, 6, 12, 24, etc.
(c) 1, 5, 10, 20, etc.

The necessity for recognizing the next expansion stage appears in the computational program when the discharge pressure required exceeds the maximum permissible line pressure. At that time the program will review its schedule of future throughput values to find the maximum. The number of stations required at maximum throughput will then be computed.

The maximum number of stations is then compared with the sets of arbitrary station series just given. If, for example, 22 stations were required at ultimate capacity, the (b) mode of expansion would be selected, and further computation would be based on the expansion series, 3, 6, 12, 24. The criterion is the minimizing of excess stations at ultimate capacity.



TYPICAL LINE THROUGHPUT CURVE with indication of the number of stations required at each throughput interval. Fig. 2.

Fig. 2 shows a typical line throughput curve with indication of the number of stations required at each throughput interval.

The number of stations required is needed not only for hydraulic data, but also for determination of required capital expenditure and operating expense. In later years, as line throughput declines, the operating expense associated with stations is reduced following Fig. 2.

The basic relations required in the design calculation may be written (see nomenclature at end of paper):

$$R_n = 92.2\ Q_l/Dv$$

$$P_f' = 0.042\ Q_l\ vg/D^4$$

$$P_f' = 0.0063924\ Q_l^{1.748}\ v^{0.252}\ g/D^{4.748}$$

$$R_n < 1{,}000,\quad R_n \geq 1{,}000$$

$$S = \frac{(P_f'\ L_k + \Delta h_k\ g/2.31)}{(P_m - k_1)}$$

where S is nonintegral, use next larger integer.

$$P_f = P_f'\ L_k/S$$

$$P_D = P_f + k_1 + \Delta h_k\ g/2.31\ S$$

$$w = 0.000017\ Q_l\ P_D/\phi F$$

Capital estimate . . . Completion of the hydraulic calculation yielding required number of stations and power per station completes the data required for estimating the capital investment for construction of the proposed pipeline.

Other required data include unit costs for pipeline installation, pumpstation construction, communications, river crossings, tankage, terminals, and other miscellaneous costs.

The capital estimate is built up from two classes of expenditures, (1) arbitrary expenditures which are unrelated computationally to any other available data in the computer, and (2) expenditures which are computable as extensions of unit costs multiplied by suitable bases.

Bases used in this way include line throughput, power required per station, line length, and number of pumping stations. Arbitrary capital costs are represented by costs for terminal facilities, waterside facilities, and river crossings. In general the latter are special costs which require independent estimate based on engineering evaluation of the construction involved.

Design practice will usually vary depending upon the size of a pumping station, and it is necessary to select proper unit costs to represent the particular design practice. In the case of

TABLE 1—SCHEDULE OF UNIT COSTS

Station power range (b.hp.)	Base cost (dollars)	Unit cost (dollars/b.hp.)
0- 500	100,000	250
500-1,500	300,000	200
1,500-4,000	600,000	190
4,000-6,000	900,000	180

pumping stations the cost is estimated as a base plus a unit cost per horsepower installed. The base and unit values may vary depending upon the power level at the station involved. Therefore, a schedule of unit costs such as the following is contained in the input data (Table 1).

The program inspects the maximum power level at the station and makes an appropriate selection from the foregoing schedule for capital estimation of pump-station costs.

The cost elements recognized in the capital estimate are pipeline construction, pump stations, river crossings, terminal facilities, tankage, communications, miscellaneous, general project, and contingencies.

The basic relation may be written:

$$C_i = (1 + k_3)(1 + k_2) \times [u_p L_k + R_k + T_i + S(b_k + b_k^* k_4 w) + k_6 k_5 Q_i + q_k + M_i]$$

Operating cost . . . Annual operating expense is estimated in a similar manner to the procedure for capital. Again, two classes of expense are recognized: (1) arbitrary costs that require independent engineering estimate, and (2) those costs related to assumed or previously computed parameters of the system, such as power, throughput, investment, line length, or number of stations.

The same problem of variable unit costs occurs here. As an example, station maintenance expense is estimated as a decimal fraction of station investment up to an arbitrary investment level at which point a smaller decimal fraction applies to all additional investment.

Cost elements recognized in the annual operating-cost estimate are station maintenance, fixed station operation, terminal operation, tank-farm operation, pipeline maintenance, communication maintenance, oil loss, pumping power, miscellaneous, and administrative overhead.

The estimating equations may be written:

$$J_5 = k_{20} S (b_k + b_k^* k_4 w) \text{ for } (b_k + b_k^* k_4 w) \leqq U$$

$$J_5 = k_{20} SU + k_7 S [(b_k + b_k^* k_4 w) - U] \text{ for } (b_k + b_k^* k_4 w) > U$$

$$J_9 = o_k S + h_t + k_8 (Q_i - H_t) + u_t k_6 Q_i + u_L u_p L_k + J_5 + u_c L_k + 365 Go_v Q_i + m_i$$

where:

$(Q_i - H_t) \geqq 0$

$$E_i = x_i + (1 + k_9) J_9 + B_a + k_{10} (Q_i - Q_R) + u_e wS$$

In the first application of the electronic computer to capital and operating-cost estimation a nearly exact duplication of the usual manual procedure was programed. As a consequence, the programs so developed were specific for a particular style of estimate preparation. However, it has been observed that a program can be advantageously generalized by providing an assortment of estimating bases. These provide flexibility in the method of estimate itself.

To illustrate, pipeline maintenance may be satisfactorily estimated by a unit cost per mile of length or by use of a unit cost per dollar of investment. It is done both ways. In order to be prepared for either mode of estimation, the program should contain the arithmetic involved in both calculations. Thus, if we take the following notation:

- L = line length, miles.
- u_L = pipeline maintenance cost, dollars per mile.
- I = pipeline investment, dollars.
- u_I = pipeline maintenance cost, dollar per dollar of investment.

The pipeline-maintenance expense may be written alternatively as $u_L L$ or $u_I I$. If the program executes both multiplications and sums them into total cost, either manner of estimate may be employed at will by the program user. The unit cost, u_L or u_I, which is not used should be read as zero, of course.

This type of generalized programming achieves two goals: (1) it gives the engineering economist a choice of estimating procedures (if six such pairs of alternative estimating procedures are incorporated in the program, the program user has available as a consequence 64 different schemes for cost estimation), and (2) it increases the probability that the estimating procedure used by a separate engineering organization may be duplicated with the existing program. This is particularly important in the case of intercompany economic study of proposed joint ventures where a common estimating procedure is determined by negotiation.

Financial Calculations

Basic objectives . . . The previous design and estimating computation generates input data for a series of financial calculations which evaluate the profitability of the proposed invest-

TABLE 2—EARNINGS PROJECTION DELTA PIPELINE STUDY

(PLAN 106)

	Years				
	1	2	3	4	5
Capital additions	10,250	.....	.....	.....	.....
Net book value	10,250	9,890	9,530	9,170	8,810
Earnings base	10,250	9,840	9,328	8,918	8,508
Loan balance	8,200	7,872	7,544	7,216	6,888
Throughput, barrels per day	90,000	90,000	90,000	90,000	90,000
Tariff, cents per barrel	7.5	7.5	7.5	7.5	7.5
Revenue	2,464	2,464	2,464	2,464	2,464
Cost of operations:					
Operation and maintenance	545	545	545	545	545
Ad valorem tax	103	103	103	103	103
Transportation tax	160	160	160	160	160
Cost of operations	808	808	808	808	808
Interest	410	394	377	361	344
Depreciation	360	360	360	360	360
Subtotal	770	754	737	721	704
Total cost	1,578	1,562	1,545	1,529	1,512
Profit before tax	886	902	919	935	952
Income tax	479	488	497	505	515
Profit after tax	407	414	422	430	437
Return on valuation pct.	4.0	4.2	4.5	4.8	5.1
Cash realization	767	774	782	790	797
Debt retirement	328	328	328	328	328
Net cash realization	439	446	454	462	469
Cumulative cash balance	439	885	1,339	1,801	2,270
Allowable earnings	718	1,000	1,239	1,441	1,296
Excess earnings	.....	.....	.....	.....	.....
Cumulative excess earnings	.....	.....	.....	.....	.....

ment. Several kinds of information are needed for this purpose.

A detailed description of an investment may be made by displaying the schedule of cash outlay and cash return from the investment. This display may amount to about 30 pieces of data.

A more concise description of the investment may be had by reporting the payout period, the term required for complete recovery of invested capital. The payout period is one index of the profitability of the investment and indicates the period over which the capital investment is exposed to the risks of the venture.

Another easily interpreted figure of merit for investment is the investment yield, or rate of return on investment.

Usually all three methods of investment description mentioned are developed in an economic study.

Additional perspective in the analysis of a proposed pipeline may be gained by computing and reporting tariffs (unit price of transportation to the shipper) required to earn stipulated returns on investment.

Elements recognized . . . The basic elements involved in the development of the output data described previously are line throughput, capital-expenditure schedule, annual operating expense, property taxes, transportation tax, interest charges, depreciation, and income tax.

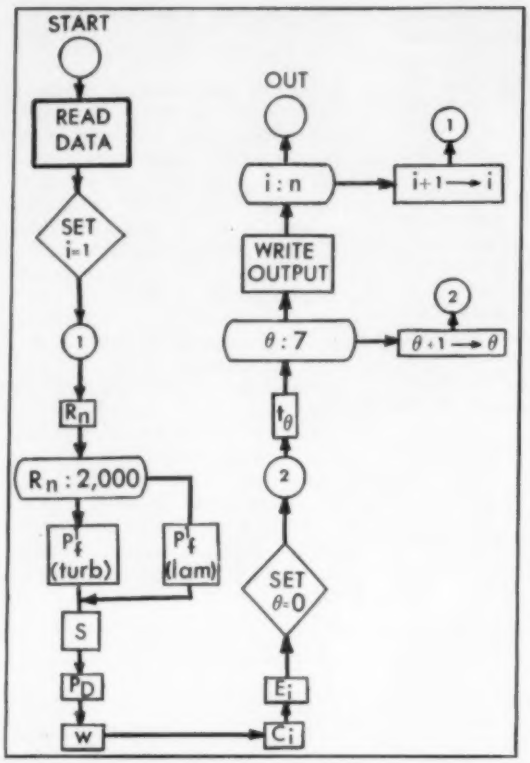
The relationship among these quantities is that of a profit-and-loss statement and is detailed later.

Year-by-Year analysis . . . In preliminary studies, or those dealing with a wide range of gross variables, such as line diameter and system throughput, a single profit-and-loss statement may serve to represent the earnings situation based on average values for the financial data involved.

However, in detailed studies of projected investment performance it is necessary to carry out year-by-year calculation of a profit-and-loss statement to determine earnings and cash realization from the venture.

In the year-by-year case, program structure recognizes as many financial considerations as are judged practical. They include:

1. The maintenance of three sets of "books" over the period under analysis: tax book, company book, and a net-investment figure based on special depreciation schedules prescribed by the Interstate Commerce Commission. Losses and earnings deficits are carried forward and act retroactively according to rules governing tax returns and allowable earnings. (Maximum earnings under a consent decree for pipeline companies is 7%. The investment valuation base against which the 7% applies is determined by ICC rules.)



TARIFF COMPUTATION FLOWCHART which outlines the procedure for a 1-year study including design, capital cost, operating cost, and financial-calculation procedures. Fig. 3.

2. Tax depreciation options, straight line or declining balance, are elected by the program user by suitably coded input data.

3. Borrowing of capital funds may be defined in detail by the program user. He may state the per cent of initial capital borrowed, the per cent of subsequent borrowing for system expansion, and the individual percentage of original borrowing to be amortized in each year of the investment life.

4. Optional use of the program for new or existing investments is possible. When employed for earnings projection of existing investment, initial balances for company, tax, and ICC net valuation are read as input data along with supplementary data stating prior losses or earnings deficits.

5. Tariffs may be allocated on different options. For a proposed system with multiple crude-oil origins, the required per barrel transportation charge may be assessed equally to each crude-oil origin. Alternatively, required transportation charges may be assessed to crude-oil origins on the basis of miles of transportation furnished plus an arbitrary rate base.

The various options and modes of computation outlined in the foregoing are controlled by the program user by coding of input data to elect those desired.

The computer outputs a year-by-year statement as shown in Table 2. The earnings projection output lists data for 5 years on a page with the projection limited to 30 years.

Payout period for the investment can be determined by comparing the cumulative cash realization data with the accumulated capital additions.

TABLE 3—SHELL PIPE LINE RATE OF RETURN COMPUTATION TOTAL INVESTMENT

(PLAN 143)

Year	Cash expenditures	Cash receipts
1	8,625	1,256
2	....	1,279
3	....	1,304
4	....	1,330
5	....	1,376
6	....	1,405
7	....	1,453
8	....	1,502
9	....	1,551
10	....	1,601
11	....	1,651
12	....	1,722
13	....	1,772
14	....	1,842
15	....	1,912
16	....	1,990
17	....	2,088
18	....	2,166
19	....	2,262
20	....	2,357
21	....	2,451
22	....	2,563
23	....	2,674
24	....	2,784
25	....	2,893
Rate of return,, %	....	16.80

One-year analysis . . . The basic relations involved in the profit-and-loss statement are shown in the following. They apply to a program for a single year computation based on average data. This program is normally used where many different values of line throughput and line diameter are to be studied.

DERIVATION OF TARIFF EQUATION

Capital investment	C_i
Throughput	Q_i
Revenue	$365\ Q_i\ t_o$
Operation cost:	
Operation and maintenance expense	E_i
Ad valorem tax	$k_a\ C_i$
Federal transportation tax	$365\ k_t\ Q_i\ t_o$
Depreciation	$k_d\ C_i$
Total	$E_i + (k_a + k_d)\ C_i + k_t\ 365\ Q_i\ t_o$
Profit before tax	$365\ Q_i\ t_o - E_i - (k_a + k_d)\ C_i - k_t\ 365\ Q_i\ t_o$
Income tax	$k_I\ [365\ Q_i\ t_o - E_i - (k_a + k_d)\ C_i - k_t\ 365\ Q_i\ t_o]$
Profit after tax	$k_p\ C_i = (1 - k_I)\ [365\ Q_i\ t_o - E_i - (k_a + k_d)\ C_i - k_t\ 365\ Q_i\ t_o]$

The equation expressing profit after tax is then solved for the tariff, t_o, required to earn a k_p fraction of investment yielding:

$$t_o = \frac{k_p\ C_i + E_i + (k_a + k_d)\ C_i - k_I\ E_i - k_I\ (k_a + k_d)\ C_i}{365\ Q_i - k_t\ 365\ Q_i - k_I\ 365\ Q_i + k_I\ k_t\ 365\ Q_i}$$

Use of the equation expressing required tariff as a function of capital and operating costs, line throughput, and required earnings is shown in Fig. 3. The flow chart shown outlines the computational procedure for a 1-year study including design, capital cost, operating cost, and financial-calculation procedures.

A typical use of the program is indicated in Table 3 and Figs. 4-7, showing how capital investment and tariffs vary with line size and throughputs.

Investment yield . . . The computation of investment yield (rate of return) requires, as input data, a schedule of cash outlay (capital expenditures) and a schedule of cash return (cash realization). The schedules are generated by the earnings projection program previously reported. Punched output data cards are reread by the computer along with a program to compute the investment yield represented by the two cash schedules.

Investment yield, as used here, has the same meaning as in everyday business usage, with the stipulation that full capital recovery will be made over the period of investment. A borrowing of $1,000, with interest payments of $50 each year for 10 years and full repayment of the loan occurring at the end of the tenth year, represents a 5% investment. If a supplementary borrowing occurred and repayment of the loan were made in irregular amounts over the loan term, the investment would be analogous to pipeline investment.

Computation of the investment yield under these circumstances can be made by finding an interest rate that will equate the sum of the present worths of the annual cash outlay values to the sum of the present worths of the annual cash realization values.

Stated mathematically, recognizing possible salvage at the end of the investment term:

Given:

$$\sum_{i=1}^{n} c_i/(1 + y)^{i-1}$$

$$= \sum_{i=1}^{n} r_i/(1 + y)^i + Xc_n/(1 + y)^n$$

Find: y (investment yield)

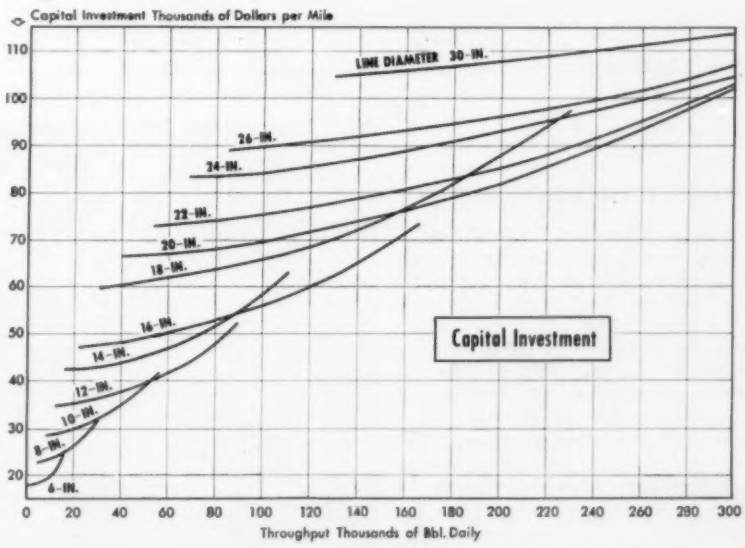
Numerical solution requires a trial-and-error procedure. The simplicity of solution for investment yield values using automatic computation is a major convenience. Manual calculation is time-consuming to the extent that application of the investment yield concept would be severely restricted.

The output from the previously described earnings projection is read as input to the investment yield program and the output listing is shown in Table 3.

Applications . . . Application of the electronic computer to economic studies has progressed from initial reproductions of manual computation methods to even more complex problems. The programs discussed have been employed in economic studies of three major construction projects with total valuation approximating 80 million dollars.

In addition to major projects, other studies have been made dealing with investment planning for gathering and trunk-line expansion. In addition, general economic studies dealing with optimum pump-station spacing and tariff policy are being carried out.

It should be recognized that the computation work reported here is only a part of the whole process of investment analysis. Much work in such analysis lies outside the domain of electronic computation. For example, basic decisions regarding estimate of crude reserves, pipeline route, design, and construction practice must



HOW CAPITAL INVESTMENT and tariffs vary with line size and throughputs is shown on this chart and the three which follow. Fig. 4.

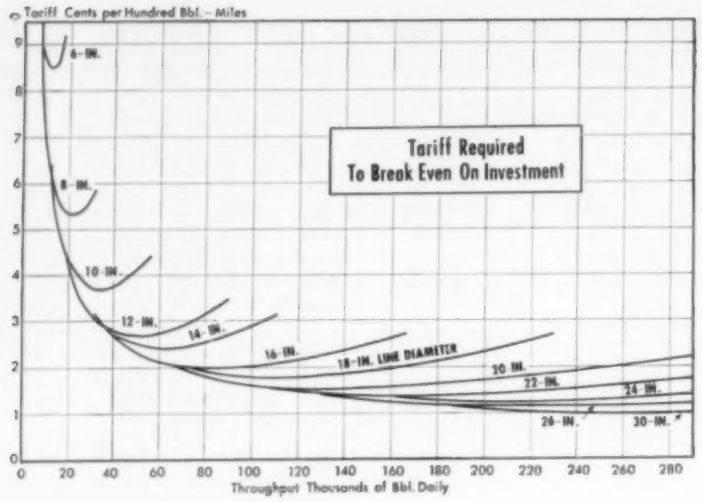


Fig. 5.

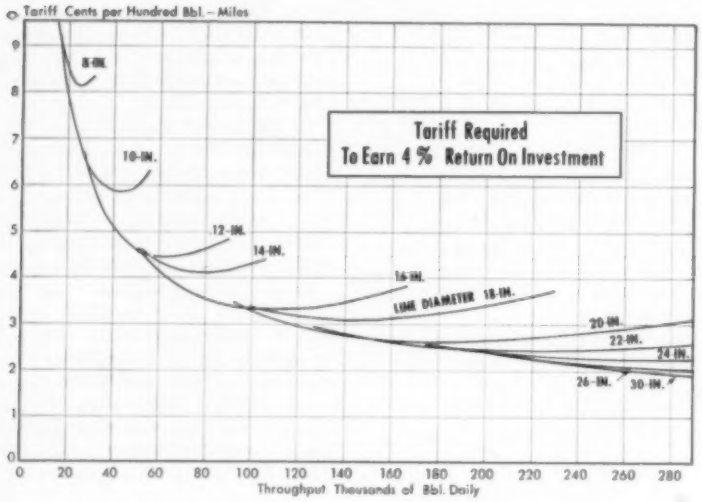


Fig. 6.

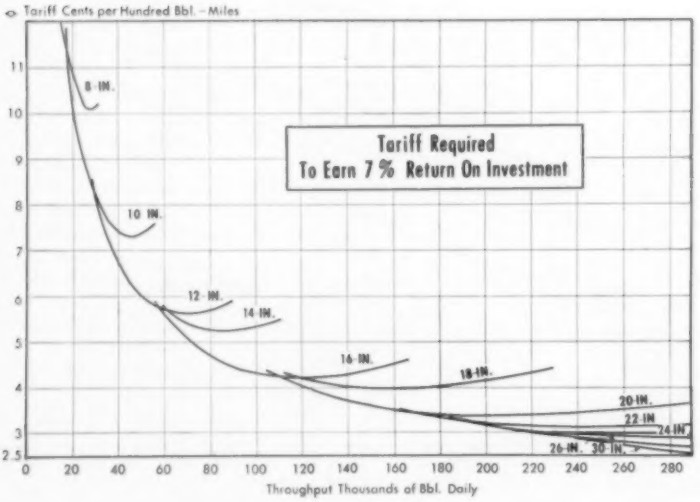


Fig. 7.

be made by engineering scrutiny of the over-all problem. Selection of these variables for study, including their ranges and interrelations, must be made. Output data from the various computer programs in turn are subject to final interpretation by the economist.

Equipment, methods, and staff . . . The computation work reported has been carried out using a basic IBM 650 digital computer with a utilization of about 30% of single shift operation time. The remainder of the computer availability was used by other activities within the organization.

The IBM 650 has been found well suited to the problems reported. Magnetic memory has been found short in some instances but the difficulty was handled by using multiple passes on the computer or reading additional program on top of discarded program memory. Magnetic-tape units are felt to be desirable and will probably be added when justification can be made.

Systems used for programing include an assembler, an interpreter, and a compiler. These are the IBM symbolic optimum assembly program (SOAP II), the Bell Laboratories interpreter, and the Purdue compiler (IT), respectively. All three systems have proven valuable and are selected according to the problem.

The staff handling the work consists of three full-time members: an engineer, a mathematician, and a programer, with occasional supplemental work by outside personnel.

Conclusions . . . Benefits achieved with automatic computation include proof that simulation of pipeline operations is practical. Such simulation is now being extended to the scheduling of oil movements and operational control (selection of pumping units to minimize monthly power costs).

The computer has facilitated the extension of economic analysis (1) to year-by-year treatment for greater accuracy, and (2) to additional criteria for investment decision, such as investment yield. In addition, a larger number of economic variables can be evaluated than by manual methods.

Acknowledgment

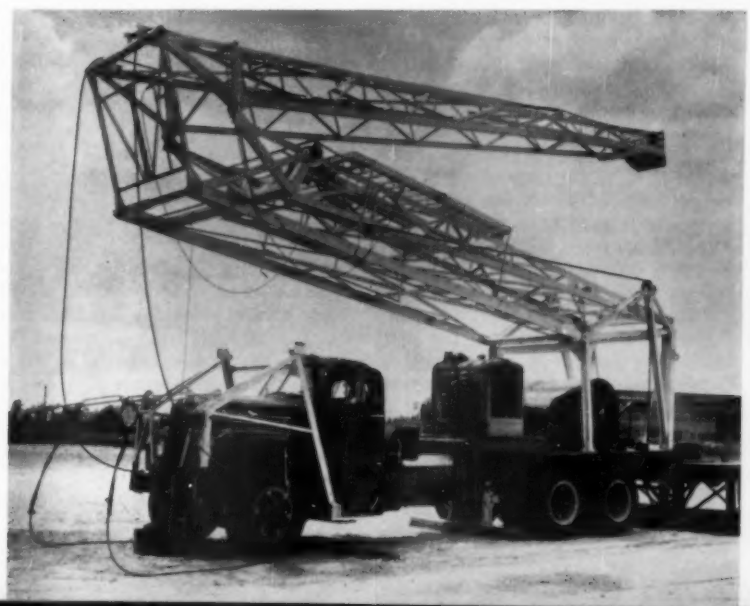
The author expresses appreciation to Robert Barton, Shell Oil Co., for long-contained instruction and counsel in the application of automatic-computing techniques; to Gerard Guyod, Shell Oil Co., for inventive and invaluable programing aid; and to Mrs. Sara Coate, Shell Pipe Line Corp., for great assistance in the use of the program reported here.

NOMENCLATURE

Symbol	Description	Unit
	Hydraulics	
D	Inside diameter	in.
F	Load factor	dec. frac.
g	Crude-oil gravity	
k_1	Pressure loss	psi. per sta.
L_k	Length of segment	mi.
P_D	Discharge pressure*	psi.
P_f	Friction pressure drop*	psi./mi.
P_m	Maximum allowable working pressure	psi.
Q_i	Throughput	b/d
R_n	Reynolds number*	
S	Number of stations*	
v	Viscosity	cs.
w	Power required*	b.hp./sta.
ϕ	Pump and motor efficiency	dec. frac.
Δh_k	Increase in elevation over segment	ft.
	Capital	
b_k	Station base cost	$/sta.
b_k'	Station unit cost	$/installed hp.
C_i	Capital investment*	$
k_2	General project cost factor	dec. frac.
k_3	Contingency factor	dec. frac.
k_4	Factor for installed power over brake power	dec. frac.
k_6	Days storage required	
k_5	Tankage cost, unit	$/bbl.
M_i	Miscellaneous cost	$
q_k	Communications	$
R_k	River crossing cost	$
T_i	Terminal cost	$
u_p	Pipeline cost, unit	$/mi.
	Operating and Maintenance Cost—Annual	
B_a	Administrative overhead, base cost	$
E_i	Operating cost, annual*	$
G	Oil loss	dec. frac.

Symbol	Description	Unit
H_t	Base throughput (terminal cost)	b/d
h_t	Terminal operation, base cost	$
k_7	Station maintenance cost, secondary unit cost	$/$ invest.
k_8	Terminal operation, unit cost	$/b/d
k_9	Other fixed general expense	dec. frac.
k_{10}	Administrative overhead, unit cost	$/b/d
k_{20}	Station maintenance cost, primary unit cost	$/$ invest.
m_i	Miscellaneous operating cost	$
°k	Fixed station operating cost	$/sta.
°v	Value of oil	$/bbl.
Q_B	Base throughput (administrative overhead)	b/d
U	Break-point invest. (station maintenance)	$
u_c	Communication maintenance cost, unit	$/mi.
u_e	Energy cost, unit	$/b.hp.-yr.
u_L	Pipeline maintenance, unit cost	$/$ invest.
u_t	Tank farm operation, unit cost	$/b/d
x_i	Division and district office expense	$
	Financial	
c_n	Net book value, end of term	$
i	Year	
k_a	Ad valorem tax rate	dec. frac.
k_d	Depreciation rate	dec. frac.
k_I	Income tax rate	dec. frac.
k_p	Earnings, basis invest.	dec. frac.
k_t	Federal transportation tax rate	dec. frac.
n	Investment term	years
r_i	Cash realization, after tax	$
t_n	Tariff required	*$/bbl./100 mi.
y	Investment yield	dec. frac.
Z	Salvage estimate	dec. frac.

*Computed data, all other data are input. †For 1,000-mile system (L_k = 1,000).



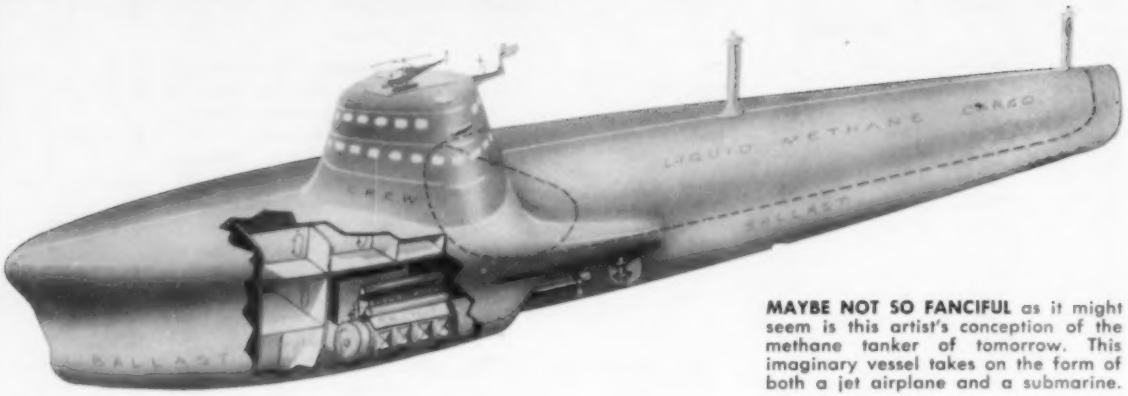
Unique Mast Ducks under height limits

A DOUBLE-JOINTED "grasshopper" type mast on a truck-mounted drilling rig is ready to start work for Lardarello Co., Pisa, Italy.

The Lee C. Moore Co. mast, which stands 70 ft. high and has a gross capacity of 200,000 lb., can be folded down flat over the truck to comply with the 13-ft., 1-in. height limit for motor vehicles in Italy. It has a 6-ft. spread at bottom.

Shipped to Italy by National Supply Co., the T-8 rig is normally used for drilling in the 1,000 to 2,000-ft. depth range and for servicing jobs in the 2,000 to 4,000-ft. category.

TODAY—An experiment
TOMORROW—A commonplace?



MAYBE NOT SO FANCIFUL as it might seem is this artist's conception of the methane tanker of tomorrow. This imaginary vessel takes on the form of both a jet airplane and a submarine.

Ocean transportation of liquefied natural and petroleum gases

Here is a roundup on the current status of investigations including types of gas; methods of liquefaction, transportation, and regasification; and the over-all economics

DR. L. VON SZESZICH
Foreign Representative, Air Products, Inc., Allentown, Pa.

OCEAN transportation of liquefied natural and petroleum gases seems to be feasible economically and from an engineering-operating standpoint. When distance between source and market is 4,500 sea miles, regasified methane at the point of use would cost $0.512 to $1.324 per M.s.c.f.

European manufacturing costs for coal gas of an equivalent heat content run from $1.00 up. Thus the liquefaction scheme is in many instances currently competitive. And work now being done should show ways to cut costs in all phases of the operation.

Most feasible means for liquefaction seems to be the normal cascade cycle; and cylindrical, vertical tanks (similar to conventional hydrocarbon-storage tanks) with good insulation offer the best bet for storage at the present time.

A bulk carrier of double-hull construction seems to be the most promising method for ocean transportation. The most practical plan at the use end is thought to be storage of liquefied gas until it is needed and then vaporization into a pipeline for distribution.

Vessel status . . . There are a number of ocean-going vessels and coastal and river barges which are in the service of transporting liquid petroleum gases (LPG). The total transporting capacity of United States LPG ships is 117,100 bbl., that of foreign ships is 298,193 bbl., and that of the U. S. barges is 153,400 bbl.[1] These figures include ships and barges both in operation and under construction. All ships and barges in operation at this time are transporting LPG at ambient temperature and under pressure.

Careful studies show that the least costly way for the transportation of large quantities of hydrocarbon gases in ships is to transport the gases in the liquefied state at atmospheric pressure in the vicinity of their boiling points. In this state, the gases occupy the smallest volume, the ratio of weight of container to that of gas is the smallest, and the ship's space is used more effectively.

Raw Materials

In the study of natural-gas liquefaction and the transportation of the liquefied gas to an overseas market, let us first consider the natural gas which is associated with crude oil and which is a byproduct of crude-oil production. In countries with limited industrial development only a small portion of this gas is used and the greatest part of it is wasted by flaring. Very large volumes of such gas are flared at present in these countries.

Heavier gases . . . Most publications

Cost for a Specific Case

(Assuming 4,500 sea miles between source and market, 50 M.M.s.c.f. per day of methane to be handled)

	Cost per M.s.c.f.
Total equipment cost, $51,500,000	
Depreciation and Return on Investment, Assuming Straightline 20-yr. Depreciation:	
Government company (5% profit)	0.234
Investment bank (25% profit)	0.875
Pipeline-company profit (11.5%)	0.482
Operating Costs:	
Liquefaction, storage, loading, shipping, unloading, and regasification	0.225
Raw material	0.056 to 0.224
TOTAL	0.512 to 1.324

on natural-gas liquefaction and its ocean transportation have considered a gas consisting chiefly of methane. It has been pointed out[2] that more than 50% by weight of the Middle East gases consist of hydrocarbons heavier than methane, and that these heavier hydrocarbons could be liquefied, transported, and stored at a cost considerably lower than that required for the naturally occurring mixture with methane.

The same author suggested that as the first step in the liquefaction and transportation of hydrocarbon gases one should use these heavier hydrocarbons and only as the second step should the methane portion of the gas be considered.

Furthermore, large quantities of propane and butane, that is LPG, could be made available from repressuring operations in overseas countries which produce crude oil. It is to be expected that the available quantity of such LPG will increase with increasing repressurizing activities. Consequently, there are good reasons to determine if the commercial transportation of liquefied hydrocarbon gases at their boiling point should begin with the methane-rich or the LPG-type gas.

If user's conditions permit dilution of the supplied gas or if climatic conditions are such that condensate will not form even during the winter, propane, butane, or LPG are also acceptable.

LPG from repressuring . . . When repressurization of oil-bearing reservoirs is carried out, the associated gas is compressed to the pressure of the reservoir. In the coolers, between the stages and in the aftercooler of the compressors, as a result of the increased pressure and the decreased temperature, the heavier hydrocarbons separate as liquids. In most cases, these LPG hydrocarbons are returned to the oil-bearing reservoir. In many cases, however, this LPG could be marketed instead of returning it to the ground.

It is expected that during the years to come repressurizing activities will increase. In areas where there is not sufficient local market for absorbing the byproduct LPG more of this gas will be available for overseas market.

THE AUTHOR

Lajos von Szeszich holds a doctorate in chemical engineering from the Technical University of Budapest. And he is rounding out 30 years of experience in this field. He has done much work on a high-pressure hydrogenation process for producing synthetic oils. He served from 1945 to 1957 as a consulting engineer in Japan and Germany. During this period he directed the development of a process for the partial oxidation of methane with oxygen in the internal-combustion engine. He joined the staff of Air Products, Inc., in 1957.

Gas liquefaction and storage

Several articles on methane and natural-gas liquefaction have discussed and compared liquefaction cycles. The most recent and probably the most complete one on this subject is the paper of Barber and Haselden.[3] This paper confirms the opinions that the most efficient practical liquefaction cycle is the normal cascade cycle. The authors state that with an efficient cascade cycle, assuming methane available at atmospheric pressure and a 30% efficiency for the generation of power, the fuel required for the liquefaction is 15.7% of the liquefied methane.

In actual cases, the gas to be liquefied contains other components in addition to methane and it is delivered to the liquefaction plant at a pressure higher than atmospheric.

Water vapor, carbon dioxide, hydrogen sulfide, and organic sulfur compounds are undesirable impurities, and they must be removed before the liquefaction and separated from the hydrocarbons in course of the cooling. There are numerous ways and processes for removing or separating these impurities. The absolute and relative quantities of each impurity and the composition of the hydrocarbon gas must be taken into account when selecting the process for their removal.

Nitrogen in the hydrocarbon gas remains in the gaseous state at the temperature of the liquefaction, and it must be separated from the liquid. Its removal as essentially pure nitrogen with a small hydrocarbon loss would require extra power. The aim,

therefore, must be to separate it as a mixture with sufficient hydrocarbons so that the mixture may be used as a fuel for operating the liquefaction plant.

Constant ratio . . . For natural gases consisting mainly of methane, it is safe to assume for initial calculations that the ratio of liquefied gas to fuel gas is constant. For example, if the gas contains 100% methane, or 80% methane and 20% ethane, the fuel consumption will be about 16% of the liquefied gas; assuming that a cascade cycle is used for liquefaction, that the gas enters the liquefaction plant at atmospheric pressure, and that the power generation efficiency is 30%. The approximate shaft-horsepower requirement can be calculated from the power-generation efficiency and the heating value of the fuel.

If the gas is available at the liquefaction plant at a pressure higher than atmospheric, the power requirements are decreased by the power which would be necessary for compressing the gas to the existing pressure.

Opinions have been expressed that, if a gas to be liquefied is cheap, the use of a simple liquefaction cycle with comparatively high power consumption is justified. One should, however, keep in mind that the capital cost of a liquefaction plant is closely related to the installed horsepower. A simple cycle with high power consumption will therefore require more capital investment than a complex cycle with considerably lower power consumption. It is true, however, that elaborate refinements of the liquefaction cycle, which result in only small power savings, might call for unjustified increases in the plant cost.

B. C. White[4] describes the liquefaction of propane at an atmospheric-pressure propane-storage system in the United States. From the data of this paper, the fuel requirement is calculated to be 1.3% of the propane to be liquefied. It is felt that the liquefaction cycle used in this case could be improved to offer a power saving. The elimination of noncondensable gases as described in this paper might also need inprovement.

Storage . . . Many proposals have been made for storing liquefied natural gas.[5] The only existing liquefied natural-gas storage is in the Soviet Union, near Moscow. Another storage system, consisting of two tanks, each capable of holding 1,000 tons of liquefied natural gas, is under construction on Canvey Island, near London. This storage system is being erected by the North Thames Gas Board for receiving test shipments of liquefied natural gas.[6]

The Cleveland disaster in the early 1940's, which took many lives and caused large material damage, emphasized the importance of the design of natural-gas-storage tanks and of the careful selection of the construction materials. Based on experiences with storage tanks for other liquefied gases, it appears now that cylindrical, vertical tanks, similar to conventional tanks used for storing petroleum products, with good external insulation are the answer to the storage problem.

When designing these tanks, thermal stresses occurring in the tank material, properties and suitability of the tank material, of the insulation, and of the protecting outside skin or shell must be considered carefully.

In spite of the insulation, some of the tanks' content will evaporate at a relatively steady rate. If there is no use for this boiloff, it must be reliquefied, and the liquid returned to the tank.

Ocean transportation

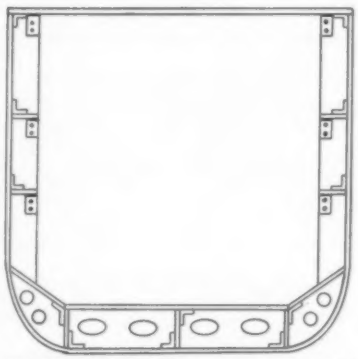
Conventional oil tankers could not be used for transporting liquefied natural gas or LPG at their boiling point. The ship's hull, bulkheads, and girders would have to be well insulated, and it would be essential to have absolute guarantees that no liquefied gas can break through the insulation and reach the carbon steel hull, the partitions, or the girders.

In case of a breakthrough, intensified local boiling of the liquefied gas would take place, and furthermore, the liquefied gas would cool the carbon-steel component to a temperature where carbon steel becomes brittle. The brittleness would soon result in destruction, not only of the exposed ship component, but ultimately of the whole ship.

Among others, J. Burns and L. J. Clark[5], and J. D. Crecca[7] have made suggestions for the general design of liquefied natural gas carrying ships. These authors proposed that the liquefied natural gas be carried in independent tanks which are either insulated and then placed in the holds of the ship, or which are placed in insulated holds.

The most practical suggestion appears to be the one of Burns and Clark which amounts to a ship of double hull construction, allowing for a very large hold without partitions, for insulated tanks. The simplified version of a ship of double-hull construction is the bulk carrier, a cross-section of which is shown in the accompanying sketch. In case of a bulk carrier the double bottom and reinforcing girders attached to the inside of the hull provide the required strength of the ship's structure.

T-2 conversion . . . Crecca proposes the conversion of a T-2 oil tanker for simultaneously carrying liquefied natural gas and oil. The tanks located along the longitudinal axis of the ship are converted to holds in which insulated tanks are placed for carrying liquefied natural gas. The wing tanks, on both sides, and the bottom tanks carry oil. Crecca points out that this arrangement of a combined carrier gives the best protection to the tanks carrying liquefied natural gas, in case of a collision.



SIMPLIFIED VERSION of a bulk carrier of double-hull construction, shown here in cross-section.

A combined carrier has been proposed for the simultaneous transportation of propane and crude oil. The proposed ships would carry 25,000 tons of propane in six insulated twin tanks placed along the longitudinal axis of the ship, and 10,000 tons of crude oil or petroleum products in the wing and bottom tanks.

Insulation . . . Tanks carrying liquefied gas can be insulated either on the inside or on the outside. Both types of insulation offer a number of technical problems. These problems, however, are not insurmountable.

If the tanks are insulated from the outside and the material of the tank is exposed to the cold liquefied gas, the tanks must be made of a material which is not brittle at the temperature of the cargo. Alloy steels and aluminum seem to be the most suitable materials from the technical and cost viewpoint.

Anyone who has been involved in designing liquefied-gas-carrying ships is well aware of the authorities and societies which must approve the design. Many problems are faced in designing to meet the requirements of these bodies. One can expect, however, that after successful operating experiences with ships have been collected, the rules of these regulating bodies will become more tolerant.

Naval architects and shipyards in several countries have made studies and have developed designs for ships which would carry liquefied fuel gases at atmospheric pressure and at their boiling point. For either liquefied natural gas or LPG, a single commercial ship would carry at least 10,000 tons of liquefied gas. The general conclusion of these studies is that commercial LPG-carrying ships could be engineered and built without great risk, whereas tests and test shipping operations would be required for confirming the correctness of the design of liquefied-natural gas carriers.

Refrigeration projects . . . In 1954, W. L. Morrison and his associates planned the liquefaction of Louisiana natural gas and its transportation by barges on the Mississippi River to Chicago. They also proposed that the refrigeration contained in the liquefied natural gas should be used for supplying refrigeration requirements of the Chicago cold-storage systems.[8] Although a liquefaction plant on a barge and liquefied gas transporting barges were built, the project was not carried through.

After utilizing the experiences of this project, and carrying out additional development work, British Methane, Ltd., in Bermuda, was established this past year with the primary aim of carrying out test shipments of liquefied natural gas from the Gulf of Mexico to the United Kingdom.[6 9]

British Methane, Ltd., is jointly owned by the British Gas Council and by Constock Liquid Methane Corp. The latter is a subsidiary of Continental Oil Co. and Union Stockyard of Chicago.[6 10] For the test shipments, a 5,000-ton cargo ship is being converted at a cost of about $4,000,000. Four rectangular aluminum tanks, each one capable of carrying 400 tons of liquefied methane, are being put into the holds of the ship so that the ship will be able to transport 2,000 tons of liquefied methane across the Atlantic Ocean.

The tanks will be installed on the outside with laminated balsa wood of about 12-in. thickness. Finally, the insulated tanks will be enclosed in steel jackets.[11] A gas liquefaction plant, and storage, and loading facilities are under construction on the Gulf Coast of the United States, while receiving tanks and regasification equipment are under construction on Canvey Island, Essex, near London.

It is expected that test shipments will start in 1959. It is believed that about three test shipments will be sufficient to prove the feasibility of shipping liquefied natural gas across the ocean and to collect the required basic experience.[6 12]

A number of other companies are planning to start the construction of large propane and LPG-carrying ships,[1 7] which would carry these gases in the liquefied state at atmospheric pressure and at low temperature. There has been no confirmation that the actual construction of such a ship has been started. It is likely, however, that during 1959 one or more of the interested companies will place an order for the construction of such ships.

LPG-carrier design . . . The design of liquefied propane or LPG carriers is basically the same as that of liquefied-natural-gas-carrying ships. The main difference is that the temperature of the cargo being considerably higher in the former case, the design temperature is —50 °F instead of about —280 °F. As a result, less-expensive material for the cargo tanks and thinner insulation can be used, and thermal stresses on the tank material and insulation are less.

Operators of liquid propane or LPG carriers, after collecting operating experiences and making use of the know-how of organizations specializing in low-temperature techniques, will have data on hand for preparing specifications for commercial liquefied-natural-gas carriers.

Whether a ship carries liquefied natural gas, propane, or LPG, provisions must be made for disposing of the boiloff gas. This can be vented after dilution with an inert gas or with air, in the latter case with so much air that the mixture is nonexplosive. The boiloff gas can be used as an alternate fuel in the power plant of the ship, or it can be reliquefied and the liquid returned to the cargo tanks.

At present, for safety and some economic reasons, reliquefaction is considered to be the preferred solution. For unforeseen event, however, provisions for dilution and venting must be made.

It is obvious that ships carrying liquefied fuel gases must adhere to careful and strict safety measures, and that the ship must carry crew members having the sole duty of maintaining the controls. The most essential safety measures are the prevention of leakage of air into the cargo tanks, the detection and location of leakage in tanks, piping and fixtures, the observation of the condition of the insulation, the ventilation of the hold space, and the detection of hydrocarbon gases in the atmosphere of the hold space.

Regasification

At the use end, the liquefied hydrocarbon gases are stored in storage tanks of the same general design as at the loading end. An advantage of liquefied hydrocarbon gases is that they can be vaporized into a pipeline at any pressure, without the use of gas compressors. The liquid can first be pumped to any desired pressure, then evaporated or heated at that pressure. The heating medium for the evaporation can be steam, water, air, or flue gases.

The utilization of the refrigeration contained in liquefied fuel gas has been suggested many times in the literature. There is no simple solution to the economic use of this refrigeration. The most economic way would be to use the refrigeration at the boiling point of the liquefied fuel gas at the pressure of regasification, that is, at the lowest possible temperature level.

Unfortunately there are very few occasions when refrigeration is required near these temperature levels. Even if such a case should exist, it is very unlikely that the amount of refrigeration which would be needed on a constant basis could be the same as the available refrigeration.

Air Products, Inc., has developed a process which makes possible the conversion of the refrigeration into energy. Energy can be used or can be sold easily. As an example of this: The energy which can be generated when methane is regasified at 200-psia. pressure amounts to about 70 hp.-hours when 100 lb. mole of methane is evaporated.

This corresponds to 68.5 hp.-hours per 1,000 standard cubic meters of methane. The amount of recoverable energy is a function of the evaporation pressure. The higher this pressure, the smaller is the recoverable energy.

Cost and economy

Much has been published and said about the costs of liquefaction plants, of storage, and of liquefied gas tankers, including operating costs.[5 6 13 14] It is felt that some of the published figures require correction, and an attempt will be made to present revised figures within reasonable limits. It is obvious that, in addition to other factors, all cost figures depend on the size of the operation.

It seems as if an operation based on using natural gas as raw material should not be smaller than 1,000 tons daily, while one based on propane or LPG should not be less than 500 tons per day. In order to arrive at a realistic figure, one should keep in mind that the liquefaction plant, in most of the cases, will have to be located in a country with limited development where erection costs, wages, and salaries for skilled labor and personnel are high, and where pioneering work, requiring extra expenses, must be done.

For investment costs of natural-gas-liquefaction plants, the literature gives a range of $196-$242 per M.s.c.f. per day which amounts to $7,300-$9,600 per 1,000 standard cubic meters per day. The figures seem to be too low, and it is believed that $300-$400 per M.s.c.f corresponding to $11,200 - $15,000 per 1,000 standard cubic meters per day would be realistic. The corrected costs refer to a liquefaction plant which receives the natural gas at 600-psig. (42 atm.) pressure, and which reliquefies the boiloff from storage.

In the literature, liquefied-gas-storage costs are estimated to be $6-$17 per M.s.c.f. or $226-$635 per 1,000 standard cubic meters of gaseous methane. It seems at though $3.70-$5.50 per M.s.c.f. or $136-$205 per 1,000 cubic meters would be sufficient provided that the actual volume of one storage tank is not smaller than about 5,000 cubic meters corresponding to nearly 3 million standard cubic meters of gaseous methane.

Operating costs . . . The operating costs of a liquefaction plant, including storage and loading, are estimated to be 8.5-10.5 cents per M.s.c.f. cu. ft. or $3.18-$3.93 per 1,000 standard cubic meters. These figures do not include raw material and fuel or power costs, nor do they include depreciation and return on the invested capital.

Capital investments for liquefying propane, butane, and LPG are considerably lower than those for natural gas. No attempt will be made to come up with definite figures, since these depend upon the composition of the raw material. First approximation estimates can be made, however, by relating capital investment to installed horsepower, which can be used either for natural gas or for LPG.

In brief, storage costs on a heating-value basis for LPG are only about one-half of these costs for liquefied natural gas. This is due to the higher specific gravity of the liquid, to the use of less-costly construction material for the tanks, and to the use of thinner insulation. In addition, operating costs for the liquefaction plant, storage, and loading are considerably lower for LPG than for natural gas.

Ship costs . . . For ocean transportation of liquefied fuel gases, ships with a carrying capacity of 10,000-25,000 tons on 100,000-350,000 bbl. of liquefied gas have been considered. For the cost of these ships, reference is made to a publication[7] reporting on a project concerning the construction of combined crude-oil and liquefied-propane carriers. The publication states that such ships would cost about $200 per ton of crude-oil-carrying capacity and $500-$600 per ton of liquefied-propane-carrying capacity.

It is felt that these figures are reasonably correct. Accepting these figures, the construction costs for ships to transport liquefied natural gas, that is, methane, would be in the range of $700-$850 per ton of carrying capacity. These costs refer to ships built in non-American shipyards; the construction costs in American shipyards are substantially higher.

For ship-operating costs, it should be noted that the hulls of liquefied gas tankers will be more than double those of oil tankers of equal cargo deadweight capacity. This gives an indication of the size of the power plant, fuel requirement, and number of crew. In addition, extra crew members will be needed for operating the reliquefaction plant and for maintaining the controls connected with the extensive safety requirements. The rate of insurance will also be a significant factor in the operating costs.

It is estimated that the operating costs for a ship of 16,000 tons deadweight cargo of liquefied natural gas, assuming a round trip of 9,000 sea miles and an average sea speed of 15 knots, would be 9-12 cents per M.s.c.f. or $3.36-$4.48 per 1,000 standard cubic meters of gas. These figures do not include depreciation or return on the invested capital.

The operating costs for propane, butane, and LPG carriers based on the cargo heating value will be 20-30% less because a ship of the same hull size, as a result of the increased density of the liquid, will carry more heating value as LPG than as liquefied natural gas.

Receiving end . . . At the receiving end, there are the costs of the liquefied-gas storage and the regasification equipment. The unit capital cost for storage will be about 10% lower than at the liquefaction plant due to lower erection costs. Costs of regasification plants are reported in the literature as $7.60-$10.00 M.s.c.f. of gas per day or $285-$375 per 1,000 standard cubic meters per day. These figures appear to be reasonably correct.

The operating costs, excluding depreciation and return on the invested capital, would be 2-3 cents per M.s.c.f. or $0.75-$1.12 per 1,000 standard cubic meters. For propane, butane, and LPG the storage costs on a heating-value basis would be about one-half of those for liquefied natural gas. The capital and operating costs of regasification when placed on a heating-value basis would be somewhat lower for LPG than for liquefied natural gas.

Cost for Specific Case

A cost estimate will now be made for one specific case, including the investment cost, total operating costs, depreciation, and return on the invested capital. Considering natural gas, or more correctly methane liquefaction, the total average operating costs for liquefaction, storage at both ends, loading, shipping, unloading, and regasification amounts to 22.5 cents per M.s.c.f., or $8.40 per 1,000 standard cubic meters, assuming a distance between source and market of 4,500 sea miles.

To these figures the cost of the raw material, fuel or power, depreciation, and return on the invested capital must be added in order to arrive at the cost of the imported gas. For the following analysis, it is assumed that per day 50 M.M.s.c.f. or 1.34 million standard cubic meters of methane, equal to nearly 1,000 tons will be liquefied and transported.

The capacity of the liquid storage at source and market will have to be 26.5 million standard cubic meters, or nearly 1 billion standard cubic ft of gaseous methane each. Two ships, each having a carrying capacity of 16,000 tons of liquefied methane, will be used for transportation.

The total capital equipment costs in this case will be $51,500,000, not including working capital, startup expenses, and interest to be paid during the construction period. The liquefaction plant will be built in a non-American country. The total unit investment amounts to $1,020 per M.s.c.f.d. or to $38,200 per 1,000 standard cubic meters per day.

Considering a basis of 350 operating days, the investment is $2.92 per M.s.c.f. or $108.60 per 1,000 standard cubic meters. Straightline 20-year depreciation has been assumed, resulting in a depreciation charge of 5% of the invested capital per year.

Return on investment . . . If a government agency or a government-owned company would undertake the venture of importing natural gas, it would probably be satisfied with a return of 5% on the non-depreciated invested capital. In this case depreciation and return on investment would amount to 23.4 cents per M.s.c.f. or $8.70 per 1,000 standard cubic meters.

The total operating costs, depreciation, and return on the invested capital would be 45.9 cents per M.s.c.f. or $16.65 per 1,000 standard cubic meters, or 10.4 lira per 1 standard cubic meter of methane. To these figures must be added the cost of the raw material and fuel or power in order to determine the cost of the imported methane.

In view of the novelty of the venture and of the risks involved, a privately owned company or an investment bank would probably expect a return on the invested capital of about 25% per year before paying taxes. In this case, the depreciation and return on capital would amount to 87.5 cents per M.s.c.f or $32.7 per standard cubic meter while the total operating costs, depreciation, and return on investment would be $1.10 per M.s.c.f. or $41 per 1,000 standard cubic meters or 25.6 lira per 1 standard cubic meter of methane.

Pipeline comparison . . . The transportation of natural gas by ship may become an operation similar to the long-distance transportation by pipeline. It is justifiable to expect that the same relative profit which is customary for privately owned pipeline companies would be acceptable for private investors and banks, after the feasibility of ocean transportation has been proven and if long-term "take or pay" contracts between the supplier and customer can be arranged.

In the United States the average yearly return of pipeline companies is 5.5% after taxes, or 11.5% before taxes. Considering this rate of return on the investment, depreciation, and profit would be 48.2 cents per M.s.c.f. or $18 per 1,000 standard cubic meters, and the total costs, including profit but not raw material and fuel, would be 70.7 cents per M.s.c.f. or $26.40 per 1,000 standard cubic meters, or 16.4 lira per 1 standard cubic meter.

If the natural gas contains heavier hydrocarbons, all these figures would decrease as a result of the higher density of the liquefied gas which affects primarily the storage and the transportation costs. It is also to be expected that after experience is gained in this new venture, the investment costs will decrease. Finally, increased size of the operation contributed to the decrease of the unit costs.

Cost range . . . Methane delivered to the liquefaction plant will cost between 5-20 cents per M.s.c.f., or per million B.t.u., or $1.97-$7.46 per 1,000 standard cubic meters or 1.17. 4.65 lira per 1 standard cubic meter. Assuming that methane would be delivered at the liquefaction plant at 600-psig-pressure, the fuel requirement would be 10% of the liquefied methane.

Considering 2% operating loss from liquefaction to the regasification plant, the total methane requirement for delivering 1 M.s.c.f. of regasified methane would be 1,120 standard cubic feet. The raw material and fuel costs will therefore range from 5.6 to 22.4 cents per M.s.c.f. or $2.09-$8.38 per 1,000 standard cubic meters or 1.30-5.23 lira per 1 standard cubic meter.

The price of the regasified methane including raw material and fuel costs, operating costs, depreciation, and return on the invested capital for a relatively small operation, would be in the range of $0.512-$1.324 per 1 M.s.c.f., or per million B.t.u., or $19.20-$49.50 per 1,000 standard cubic meters, or 12.7-30.9 lira per 1 standard cubic meter, depending partly on the cost of raw material, but mainly upon the magnitude of the return on the invested capital.

In Europe the manufacturing costs of coal gas, not including byproduct coke-oven gas, are about $1 per M.M.B.t.u., and in some cases even higher. It has been demonstrated that there is a chance of importing methane under favorable circumstances, for a price of less than $1 per M.M.B.t.u., even in the case of a comparatively small operation.

For propane, butane, and LPG, it can be stated that transportation and storage in the liquefied state at atmospheric pressure is less costly than the present method if large quantities (minimum of about 500 tons per day) can be transported. It is also true that increasing quantities of these hydrocarbons can be made available, especially from repressurizing operations. One can expect, therefore, that this new method of transportation of these gases will soon become a reality.

Transportation Investment

A brief comparison between investment costs for transportation of methane by pipeline versus ship will be made. It is assumed that $51,500,000 must be invested for transporting 50 M.M.s.c.f. per day of methane between two points situated 4,500 nautical miles from one another. If the same quantity of gas would have to be transported by overland pipeline, the pipeline, with pumping stations, would cost about $180,000,000.

This is 3½ times the investment required for liquefying and transporting the gas by ship. Roughly 800 nautical miles is the distance for both methods of transportation to require the same capital investment. With increasing size of the operation, the distance for equal capital investment will increase, since the decrease in unit investment cost with increasing size of operation is greater in the case of pipeline transportation than in the case of ship transportation.

One should also consider, however, the fact that the fuel-gas transportation by ship has the great advantage that one source, with only slight additional investment, can serve any additional number of customers located in different directions.

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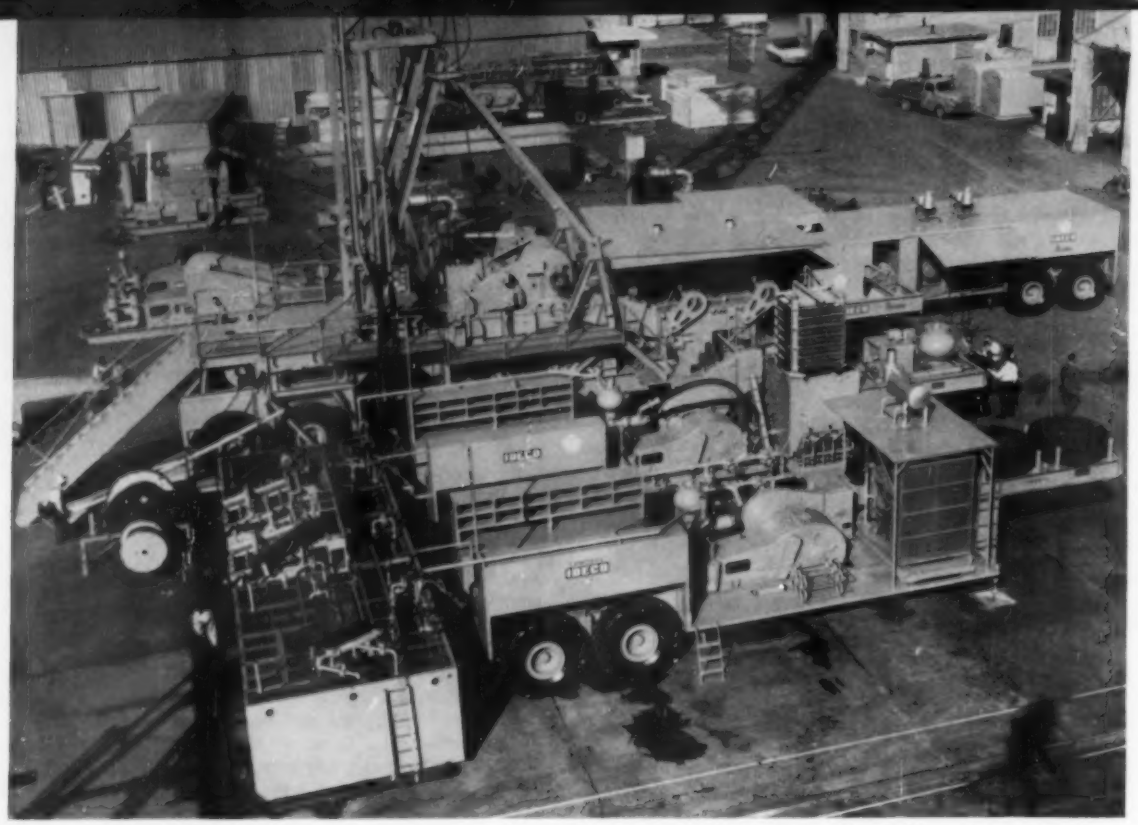


HUGE SAND TIRES on permanent wheels will give this rig extreme mobility in Libya's desert drilling.

Desert rig works on wheels

DELIVERY has been accepted by Camdrill International, Inc., drilling contractors operating in North Africa, of one of the most completely unitized and mobile drilling rigs of its size ever built and equipped. The specially designed "Desert Star" will carry out an extensive drilling program for Esso Standard of Libya.

Rig-up and moving time on the new rig will be a minimum because of its complete wheel-mounting on huge sand tires and because of unitizing pumps, manifolding, and mud tanks. The rig uses the basic Ideco Dual Rambler design. All its major components are mounted on five semitrailers. To move these trailers over the desert, three 300-hp. diesel trucks, also equipped with high flotation-type sand tires, will be used.

Camdrill says that the rig can be moved 20 or 30 miles over difficult terrain and rigged up ready to spud in a single 8-hour tour. Conventional rigs of the same capacity might require as much as 6 to 8 days for moving and rigging up.

Heat, terrain, distance . . . Camdrill says that the three major factors in desert operations are weather, terrain, and distances. Average temperatures in Libya vary from 60° to 130° F. in summer and from 32° to 80° in winter. Sand and dust storms are frequent. Terrain includes shifting sand and loose rock. Supply centers are continents away.

Thus the rig had to be capable of moving without roads, to withstand desert heat, and be self-supporting.

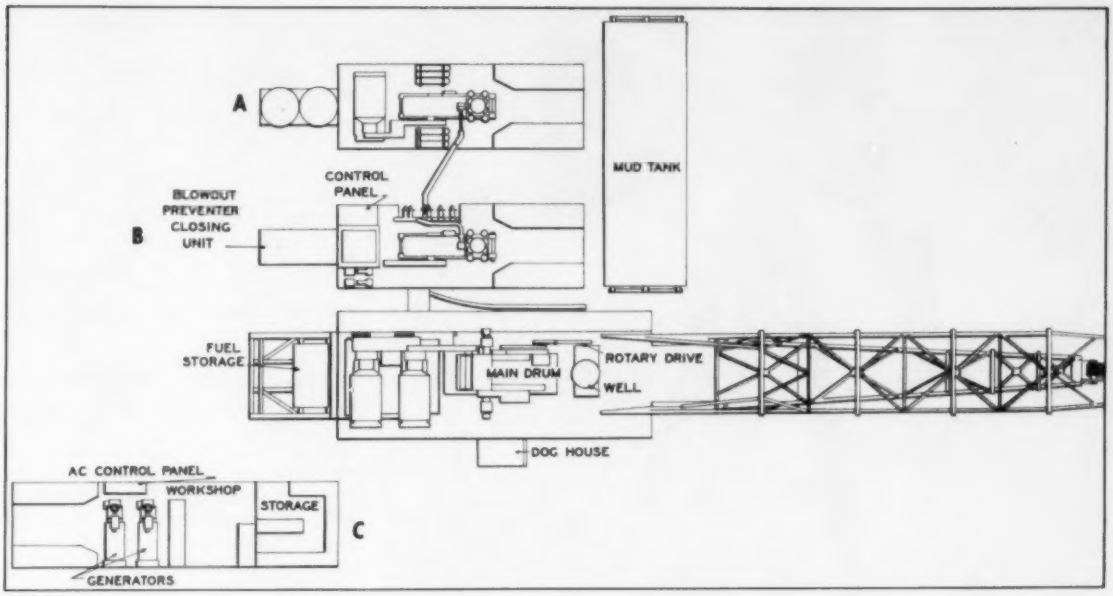
The five rig semitrailers are equipped with 21:00 by 25-in. sand tires. All engines have oversize radiators and dual air cleaners and fuel filters. In addition, canvas drop curtains have been installed to protect from dust and heat. All chains are completely sealed and only one chain to the rotary has to be broken to move the rig.

Since supply is a major desert problem, Camdrill has equipped the rig with engine and machinery spare parts. In addition, the utility trailer carries a complete set of fishing tools and a mechanic's workshop. All except major repairs can be made on location.

Moves in eight loads . . . The Desert Star's five semitrailers include: draw-works trailer; mast trailer; two heavy-duty pump trailers; and a heavy-duty utility trailer. An Ideco H-525-D double-drum drilling and workover hoist is mounted on the draw-works trailer. The rig has a nominal drilling depth rating of 5,000 to 8,500 ft. Two Cummins VT-12 turbocharged diesel oil-field power units drive the draw works through a two-engine, three-shaft in-line compound. The power units have a rating of 495 intermittent horsepower each.

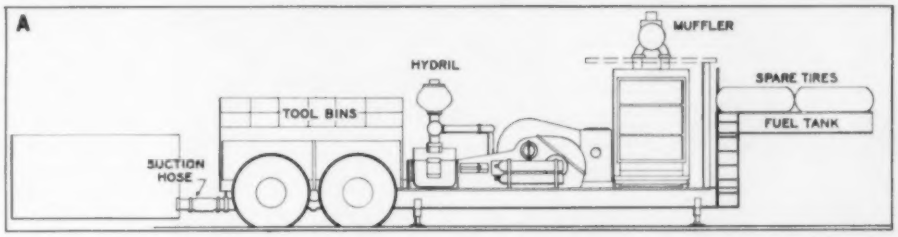
The mud system, excepting mud tanks, is completely wheel-mounted. Two Emsco D-300 power slush pumps are mounted on individual trailers. One is driven from the draw-works compound through a propeller shaft drive. The other is unitized with a VT-12 power unit. Both trailers have tandem bogie units. Storage bins are built into each side of the trailers over the bogie units. A pulsation dampener complete with controls is mounted on the No. 1 pump trailer. On the same trailer, there is an evaporative cooling tower for the water supplying brake drums and the auxiliary brake.

The mud manifolding system is completely built into the pump trailers, to reduce rig-up time and to increase independence of the rig. The mani-

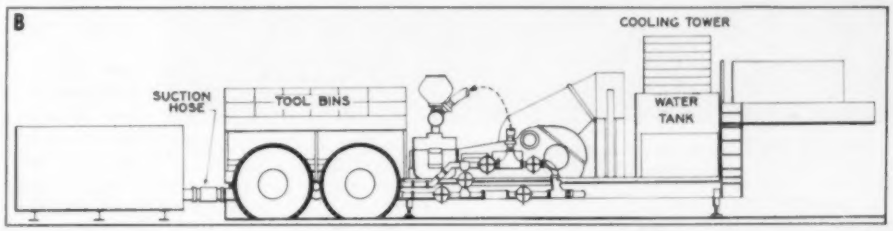


COMPACT arrangement of Camdrill trailer-mounted drilling rig is shown in the over-all layout above.

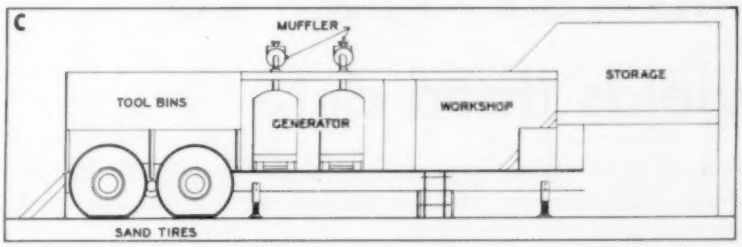
ELEVATION of trailer-mounted unitized pump drive is shown in diagram A at right.



TRAILER-MOUNTED pump is shown in elevation in diagram B at right.



UTILITY TRAILER with workshop and storage is shown in elevation on diagram C at right, below.



folding system is built to operate pumps singly or in compound.

A Lee C. Moore 126-ft. dual trailer-mounted drilling mast is mounted on the mast trailer. The mast has a horizontally retractable top section and special rear gin poles. API derrick equivalent capacity of the mast is 420,000 lb. The mast has a capacity of 10,800 ft. of 4½-in. drill pipe.

A complete mechanic's workshop is built into the utility trailer, which is entirely enclosed. Bins store fishing tools and subs, as well as engine and machinery spare parts. Also mounted on the trailer are two 60-kw. generator sets. These provide power for auxiliary equipment as well as lighting. A 100-gal. fuel tank for the generator units is built into a gooseneck of the trailer.

The 500-bbl. mud tank (12 ft. wide, 40 ft. long) has four compartments for mixing, settling, suction, and storage. It is said to be the largest ever built for a portable rig.

The entire rig can move in eight loads. In a typical move the mast and draw-works trailers go on the first trip along with the No. 1 pump trailer. While the mast and draw works are being rigged up for spudding in, the three tractors move the mud tank, the second pump trailer, and the utility trailer. On the third trip the tractors pick up the drill-pipe bins which can be loaded onto float trailers in a few minutes. Each pipe bin has a capacity of 2,000 ft. of 4½-in. drill pipe. In addition, each pipe bin is constructed to provide storage for casing.

FLOW-RATE TESTS were run on samples of injected water to determine the effect of citric acid on water properties. Results were favorable in most cases.

Pfizer's Program 20 yields flood data

Tests on 354 water-flood and 92 disposal projects demonstrate the usefulness of citric acid in sequestration of iron.

BY WILLIAM E. BELL
AND JOHN K. SHAW
Chas. Pfizer & Co., Inc., Brooklyn

LAST SUMMER Chas. Pfizer & Co. sponsored Program 20, in which 20 upper classmen from various universities made tests on a number of water-flooding projects (OGJ, May 12, 1958, p. 168). They were all majors in chemistry, chemical engineering, or petroleum engineering. They were specially trained by Pfizer to carry out the field tests to show the susceptibility of water to citric acid treatment. This was a natural follow-up of some previous laboratory work done by the company (OGJ, Mar. 19, 1956, p. 126).

Citric acid uses . . . There are four possible applications of citric acid to water-disposal or water-flood projects:

1. Maintenance treatment with citric acid.
2. Acidizing with citric and hydrochloric acid.
3. Citric acid plus detergent for cleaning injection wells.
4. Slug treatment with citric acid.

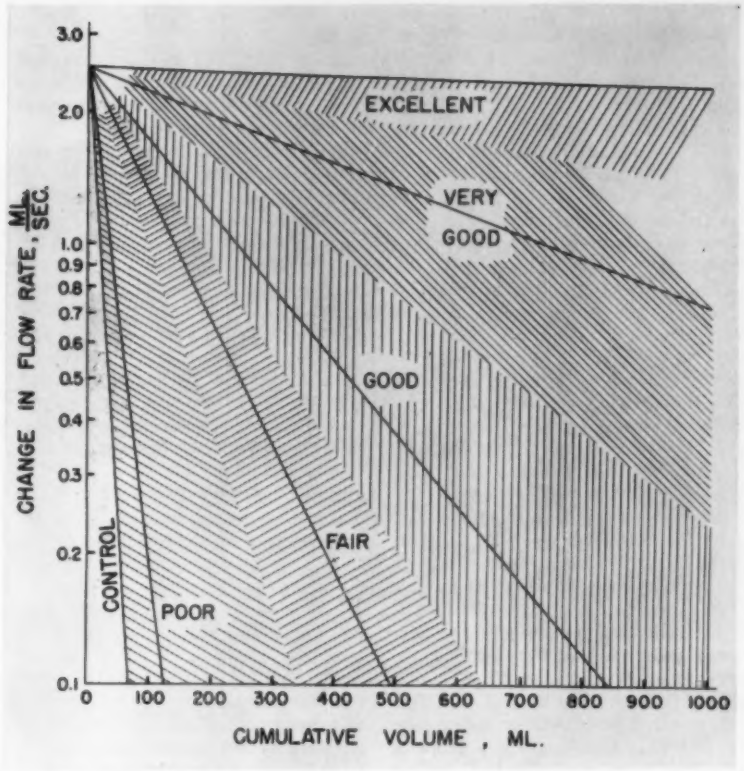
Maintenance treatment entails the constant addition of citric acid (3:1 or 4:1 ratios of citric acid to iron content) to prevent iron from filtering out on the sand into which the water is injected. This helps to maintain high injection rates at normal pressures. Acidizing and detergent treatment are important adjuncts to successful maintenance treatment. For best results in maintenance treatment with citric acid, a water-injection plant should be operating at optimum injection rates and pressures. When iron plugging and sandface is the cause of lowered rates or high pressures, acidizing or detergent treatment with citric acid may help to return the injection wells to optimum conditions.

Slug treatment with citric acid is designed for those systems where the water contains iron which cannot be economically treated to keep the iron in solution, or for those systems where the iron is completely precipitated before the water can be treated. Slug treatment at 500 p.p.m. once every 4 to 6 weeks sufficiently lowers the pH to dissolve much of the insoluble iron, and the cost of treatment is low when averaged over this period of time.

Test results . . . During the program Millipore filter tests were performed for 354 water-flood projects and for 92 salt-water-disposal projects. Of the 446 projects about 75% were designated as closed systems, and the water was collected and tested with a mineral-oil seal (the water did not contact air during the experiments). The projects tested were injecting approximately 2,000,000 bbl. of water per day.

The results were evaluated by plotting the change in flow rate (ml./second) versus cumulative volume (ml.), and estimating the degree of improvement in water quality when citric acid was added. The improvements in water quality were rated excellent, very good, good, fair, poor (see chart). The color of the filter disks also was used to determine the effectiveness of citric acid in preventing iron from forming precipitates in the water.

Of the 446 projects, 16 were not tested with citric acid; one flood injecting iron-free water did not require citric acid and in 15 cases reproducible results could not be obtained because of large quantities of undissolved solids in the injection



THIS CHART was used to classify the results of the field tests. About 60% of the tests were classified "good" or better.

water. The average quantity of iron in all waters tested was about 12 p.p.m. The highest quantity found was 450 p.p.m. in a salt-water-disposal system.

At the remaining 430 projects 529 tests were performed, with the following ratings:

	Excellent	Very good	Good	Fair	Poor
Number	59	78	171	116	105
Per cent	11.1	14.8	32.2	21.9	19.9

Twenty-five per cent of the tests were rated in the excellent and very good categories, and indicate that iron is probably the most serious cause of plugging problems and poor water quality. Iron in injection water is a major cause of poor water quality but usually is not the only problem. Carbonate and sulfate scales and traces of oil are frequently occurring problems as seen in examining the causes of fair and poor results.

In 94 of the tests classed as fair or poor, the problems were traced to the presence of insoluble inorganics in the water, i.e., iron oxide, calcium or magnesium sulfates or carbonates, silicon dioxide and, in a few cases, barium sulfate. Traces of oil present in produced water led to fair or poor results in 20 tests. Oil coated the Millipore filter disks in much the same way that oil forms impermeable films on the sandface. Frequently, the color of the disks would be much lighter from citric acid-treated samples, indicating that the iron was sequestered, but the flow rate was still retarded by the oil. It should be pointed out that this oil was usually not immediately apparent, but could be noted by the sheen imparted to the disk.

Thirty-two tests were rated as fair or poor because of ferrous sulfide formation. In some cases the water was retested at some other part of the system with better results. If the ferrous ions can be sequestered before ferrous sulfide forms, or even better, before coming in contact with hydrogen sulfide, the chances for minimizing difficulties are much better. Since ferrous sulfide is preferentially oil wet, even the addition of large excesses of citric or hydrochloric acids has no effect. The addition of a detergent capable of making oil-wet particles water wet is frequently helpful.

Twenty-five tests were rated fair or poor because the injection water was of excellent quality. Chemical additives did not improve on the flow rates obtained with untreated samples.

The remaining 50 tests were rated in the fair or poor category because of several factors. In some of the cases involving open treating systems, the tests were rerun after proper bacterial control was accomplished, and much better results with citric acid were obtained. Some poor results were traced to the presence of a filter aid, e.g., finely divided sand or diatomaceous earth, in the water.

The concentration of iron in injection water is not the only cause of plugging problems. In open treating systems, even the smallest amounts of iron are capable of causing very poor water quality, because of the extreme insolubility of iron oxide and its ability to form colloidal dispersions. In general, test results with citric acid in such systems were good. Results from filter tests depended on obtaining water samples with the iron in solution. For example, some waters at the injection wellheads contained 1 p.p.m. iron as ferric oxide, and the addition of 4 p.p.m. citric acid had little effect. When the samples were obtained at filter units and the 1 p.p.m. iron had not precipitated, excellent results were obtained. Incomplete sequestration was found when 2 p.p.m. citric acid was added to water containing 0.5 p.p.m., probably because of the very dilute concentrations of the iron and citric acid. When the iron content was less than 2 p.p.m., addition of at least 10 p.p.m. citric acid gave best results.

In certain closed systems, the iron content of the injection waters was frequently much greater than 20 p.p.m. These waters were not as poor in quality because of the greater solubility of ferrous ions, in the absence of sulfides and oxygen. Often, only a fraction of the iron in the water precipitated as ferrous hydroxide and, therefore, the ratio of citric acid to dissolved iron was much less than 4:1. In general, floods using this type of water were limited to North Texas, West Central Texas, and parts of Oklahoma.

In West Texas and Southeast New Mexico, the majority of closed-system floods used water containing hydrogen sulfide or sulfides. Under these conditions much less than 1 p.p.m. iron could be held in solution. Fifty-seven tests in the good-to-excellent categories were performed on H_2S-bearing waters. There was no apparent correlation between citric acid performance and hydrogen sulfide concentration (10—2,000 p.p.m.). A better criterion would be the presence or absence of oil in the water since ferrous sulfide is preferentially oil wet. It should be mentioned that the addition of a nonionic detergent with citric acid has been successful in some floods.

Application . . . To obtain the best re-

sults from citric acid, the optimum location in an injection system should be determined for the addition of citric acid. This can be done by testing with acid addition at various points in the system.

Then, the concentration of citric acid required to sequester the iron, or to improve the water by a given amount, should also be determined. This has been done by starting injection at 40 to 50 p.p.m. citric acid, and gradually decreasing this amount until the proper level is reached. This technique has merit because the excess citric during the beginning of treatment serves to gradually remove scale and rust deposits on pipelines and equipment. Millipore filter tests again are very helpful in determining the correct concentrations of citric acid.

Salt-water-disposal projects present more complex chemical treatment problems, not the least of which is economics. It is rare when iron is the only chemical problem in these projects, and for this reason, the regular addition of one or two chemicals simply increases the cost with only slightly improved results. The use of citric acid with a good detergent for cleaning disposal wells or slug treatment of disposal wells has been successful in many cases. It appears to be good practice to follow such operations with a few hundred gallons of 5 to 15% hydrochloric acid. The total chemical cost of such treatments is nominal.

Field results . . . Some information was obtained on methods of incorporating citric acid into injection water. The most popular method involved the addition of citric acid through a chemical pump into the suction side of pumps immediately after filtration of the water. The chemical pump should be stainless steel or aluminum bronze, or at least protected from corrosion of concentrated citric solutions by adding a good corrosion inhibitor. The inhibitor should be added directly to the citric acid solution.

In a second method the citric acid is dissolved in water in an asphalt-lined container. The container is fitted with plastic tubing and a valve, the solution being fed by gravity into the system.

A third method uses a lubricator or "boll-weevil" arrangement made of parts easily constructed by a machine shop. A piece of 6 or 8-in. pipe long enough to hold about 5 gal. of solution, with valves attached to each end, regulates the quantity added.

Case histories . . . In northern Oklahoma, considerable success has been obtained by adding 10 to 12 lb. citric acid and 1 gal. of Triton X-100* every day. These systems had been plagued with hydrogen sulfide from sulfate-reducing bacteria and traces of oil, which resulted in a difficult ferrous sulfide problem. These injection wells had been taking 10 to 30 bbl. of water per day. Injection rates are about three times greater than before treatment.

Two salt-water-disposal wells in southern Texas, with average injection rates of 200 to 400 bbl. per day, showed a 30% increase in injection shortly after only 8 p.p.m. addition of citric acid was started as maintenance treatment.

A well in southern Louisiana was treated by slugging with two 400-lb. batches of citric acid, 2 weeks apart. Injection rates have more than doubled, from 4,000 to 8,640 bbl. per day, at last report, and in addition, the pressure has averaged 300 psi. lower than previous requirements.

An acidizing operation in Oklahoma used the addition of 260 lb. citric acid, 25 gal. Triton X-100, 250 gal. 15% hydrochloric acid, and 500 gal. water. The injectivity index rose to 195 bbl./day/ft. of pay from 3 bbl./day/ft. of pay. Gradual decline was noted over a short period, but the index leveled at 80 bbl./day/ft. of pay.

*Rohm & Haas Co., Philadelphia.

Other operators have noted good results because of less frequent down time on filters, and less replacement of parts because of rusting.

It is impossible to predict the success of citric treatment for any one system because of the larger number of variables in each system and variations from one system to another. During Program 20 there were two or three occasions where the application of citric acid was not overly successful. It is believed that all of the conditions were not sufficiently defined for determination of the proper treatment.

Analysis of the flow-rate tests will show the degree of success possible with citric acid, but this does not give the complete answer. Each system has to be studied carefully before action is taken, and even then the course of action may be altered during actual field use. An excellent example is the case of the operator in Oklahoma who was adding citric acid to each injection well with no apparent results. Millipore filter tests indicated that the iron had already precipitated, and that citric acid would serve better if added at the gathering lines in the pumphouse. Almost immediate improvements in injection rates were noticed.

BOOKS

CANADIAN OIL & GAS DIRECTORY 1958-59. Published by C. O. Nickle Publications, Ltd., 100 Petroleum Building, 310 Ninth Avenue S.W., Calgary, Alta. 440 pp.

The latest issue of this publication contains individual listings on the more than 2,000 firms that together are the oil industry.

Key personnel of these companies is alphabetically indexed in separate sections, and government bodies through which the industry must operate are listed in detail.

Other features of the new publication include complete listings of industry, clubs and associations, officers of those organizations, and a special map and statistic section.

FEDERAL REGULATION OF NATURAL GAS IN THE UNITED STATES. By Edward Falck and Francis X. Welch. Published by Edward Falck & Co., 1625 Eye Street, N. W., Washington 6, D. C. 100 pages. $2.

This volume begins a summary of the FTC's investigation and the Splawn Report, leading up to the enactment of the Natural Gas Act of 1938 by Congress.

With this background material outlined, the authors then begin an extensive discussion of federal regulation of natural gas in this country. An explanation and critique of utility regulation in the United States is given, and the salient features of the Natural Gas Act and its amendments are outlined.

Certificates of public convenience and necessity are discussed, and one chapter tells of rates under the Natural Gas Act. The book concludes with a report on export and import licenses, tells of the delegation of presidential authority, details requirements of application, and cites leading cases in the field.

RAW MATERIALS: A STUDY OF AMERICAN POLICY. By Percy W. Bidwell. Published by Harper & Bros., 49 E. Thirty-third Street, New York 16. 403 pp. $5.95.

This volume describes the conditions of demand and supply, particularly as they have developed since World War II, and the principal features of national policy affecting production and trade in basic materials.

The author discusses our—and the free world's—requirements, present and future, and the conditions of supply. He suggests modifications in American policies to conform to technological advance and to the changing position of the United States in international affairs.

One part of the book consists of a series of case studies on lead and zinc, copper, nickel, wool, rubber, oil and ferro-alloys. Each of these studies provides a background of economic information and describes and criticizes pertinent measures of government policy. The book is carefully indexed. It contains a bibliography, 45 tables and 16 charts.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

New motor development obsoletes today's application practices!

Only from Allis-Chalmers!

Super-Seal motors save up to 60%

Here's an amazing advance in motor technology! It's the *Super-Seal* motor line—an open motor design so completely unaffected by moisture, dust, dirt, oil, acids and alkalies that it can be used in many applications previously requiring more costly enclosed motors. *Savings range from 15 to 60%.*

Super-Seal motor superiority results from two distinct revolutionary insulating techniques. Available in any integral horsepower size, smaller *Super-Seal* motors incorporate a *Poxeal* stator. A durable epoxy resin encloses the stator, creating an electrical system impervious to outside elements.

In larger sizes, *Silco-Flex* insulation is used. In this system, silicone rubber is vulcanized into a homogeneous mass to form a flexible, moisture and heat resistant, void-free dielectric barrier around coils and leads.

Both of these insulation systems are unsurpassed. Proof? An encapsulated motor ran for hundreds of hours at full load in a 4% brine solution.

Find out more by reading the next pages; then contact your A-C representative or distributor, or write Allis-Chalmers at address shown on back page.

A-C **ALLIS-CHALMERS**

51B 9100

Two revolutionary insulating techniques developed and pioneered by Allis-Chalmers mean savings of millions of dollars for motor users . . .

New open motors are unaffected by moisture and contaminants

Modern insulating materials and new methods of application, now available in *Super-Seal* open-type motors, are drastically changing motor application standards. These insulations are so completely impervious to moisture and contaminants that *Super-Seal* open motors can be used in most applications formerly requiring costly enclosed designs. Existing applications have resulted in savings as high as 60%.

Basic insulation systems

Larger *Super-Seal* motors with form-wound stator coils use the *Silco-Flex* insulation system. Heart of this system is a remarkable rubber-like silicone elastomer, applied in semi-cured state and vulcanized to form a void-free, impervious dielectric barrier. More than four years of development and field testing have proven the superior electrical and physical properties of *Silco-Flex* insulation systems.

Stator coils of smaller random-wound motors are protected by equally effective *Poxeal* insulation system. A tough, durable case of epoxy resin completely seals the winding end turns and slot portions. Bonded to the stator laminations, it forms a seal completely impervious to contaminants.

Moisture resistance

In addition to being void-free, the silicone elastomer used in *Silco-Flex* insulation is moisture repellent. Even in high humidity, moisture does not form a surface film of condensation. Coils with this protection can operate completely immersed in water. In fact, one of the recommended cleaning procedures is use of detergent and water.

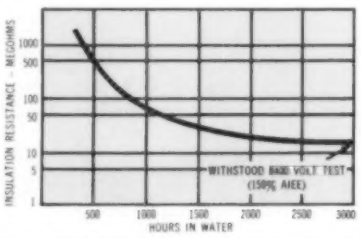


Fig. 1—Test curve shows insulation resistance of *Silco-Flex* insulation while immersed in water.

Moisture resistance of *Silco-Flex* coils is demonstrated in Fig. 1. After more than 3000 hours of total immersion with 2300 volts impressed on the coil, the test was terminated when it became apparent that little more drop could be expected in the coil's insulation resistance. At that point the coil still withstood a high potential test of 8400 volts without injury.

Encapsulated stator windings are equally well sealed. Motors with *Poxeal* insulation protection have been thoroughly tested under water while operating with full load and full voltage.

Resistance to contaminants

Silicone elastomers and epoxy resins are relatively inert to attack by practically all reactive agents. Further, the void-free construction of insulation systems used in *Super-Seal* motors prevents penetration of contaminants. As a result, *Super-Seal* motors are unaffected by oils, most acids, salt solutions, alkalies, and oils and are ideally suited for such applications.

Thermal stability

Temperature-wise, *Silco-Flex* insulation can easily withstand hot-spot temperatures of 200 C and more—

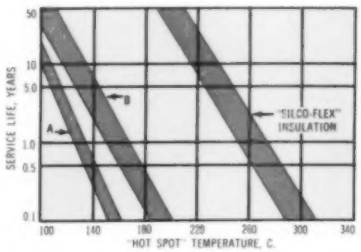


Fig. 2—Chart shows that *Silco-Flex* insulation more than meets Class H requirements.

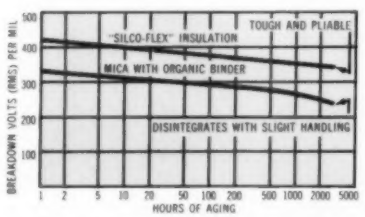
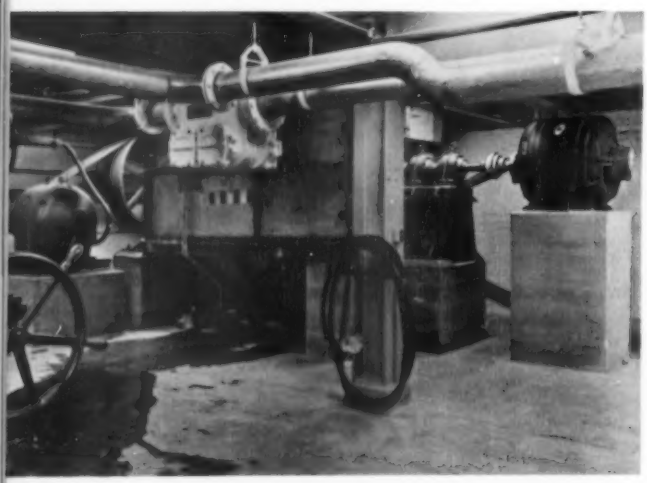


Fig. 3—Tests of 2300-volt insulated bars show thermal stability of *Silco-Flex* insulation.



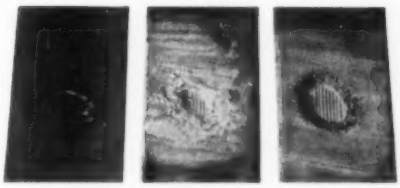
Paper mills have wide application for *Super-Seal* motors because of moist atmospheres.

easily meeting Class H temperature requirements (Fig. 2). At temperatures where the life of Class B coils would be measured in weeks, the life span of *Silco-Flex* coils is well beyond machine obsolescence.

Comparison with a mica-organic binder insulating system (Fig. 3) offers further proof of thermal stability. After 2000 hours of aging at 200 C with 8500 volts applied continuously, the *Silco-Flex* insulated coil was still tough, pliable, and completely serviceable. The mica-taped insulation had deteriorated to the point where it disintegrated readily and was completely useless.

An added advantage of *Silco-Flex* insulation is unusually high thermal conductivity — about twice that of conventional insulations. This means heat dissipates faster from its point of generation.

Poxeal insulation also demonstrates remarkably good thermal stability. Materials now in use are suitable for Class B temperatures, although actual classification of the insulation is determined by the basic material used.



Silco-Flex Insulation | **Polyester Mica Tape** | **Asphaltum Mica Tape**

Fig. 4—Samples of motor insulations after sandblasting give comparison of abrasion resistance.

Abrasion resistance

Resistance to abrasion is still another point of superiority in the insulation systems used for *Super-Seal* motors. Abrasion resistance of *Silco-Flex* insulation is compared to other types of insulation in Fig. 4. After one minute of sandblasting with 90-grit aluminum oxide and 100-psi air, only slight surface erosion appeared on the *Silco-Flex* sample. Other insulations were eroded to bare copper.

Application practices obsolete

The superior qualities of *Super-Seal* insulating systems, developed by Allis-Chalmers, make it necessary to reappraise present application practices. With virtually ageless insulation, *Super-Seal* motors assure more reliable service and require less upkeep than the best protected, conventionally insulated machines — and at considerably less cost.

Super-Seal, Poxeal, and Silco-Flex are Allis-Chalmers trademarks.

SOUTHERN CEMENT · CONTINENTAL CAN · AMERICAN OIL · CELOTEX · SCOTT PAPER · HURON PORTLAND CEMENT · FORD · FIRESTONE · PACIFIC GAS & ELECTRIC · STANDARD OIL OF INDIANA · B. F. GOODRICH · DOW CHEMICAL · MARLEY · INGERSOLL-RAND · LINK-BELT

WIDE ACCEPTANCE

of Super-Seal motors proves their advantages

Cement, petroleum, chemical, steel, mining, paper, utilities, municipalities and general industry — outstanding corporations in every field are specifying *Super-Seal* motors wherever operating conditions are tough.

Cost and *superior insulation* aren't the only reasons. Users are getting MORE MOTOR, too. Here's why:

Standard totally-enclosed motors, 55° C rise, have a *service factor of 1.* In other words, "nameplate" horsepower is the maximum. A 40° C rise *Super-Seal* motor with *Poxeal* insulation, and a 60° C rise *Super-Seal* motor with *Silco-Flex* insulation have a *service factor of 1.15.* For comparisons on what this difference means in required motor sizes, see this chart:

Rated Horsepower (Maximum Hp, TEFC)	Maximum Continuous Hp—Super-Seal Motor
15 hp	17.25 hp
25	28.75
40	46
75	86.25
125	143.75
200	230
350	402.5
500	575

Join the swing to *Super-Seal* motors. It will pay dividends fast. Contact your A-C representative or distributor, or write Allis-Chalmers at address shown on back page.

ALLIS-CHALMERS

SOUTHERN CALIFORNIA EDISON · LONG ISLAND LIGHTING · AVCO · UNION BAG · UNIVERSAL ATLAS · UNION CARBIDE · OHIO OIL · INTERNATIONAL PAPER · SOUTHERN PACIFIC PIPE LINE · ALCOA · ROHM & HAAS · ARMOUR · SHELL OIL · COMMONWEALTH EDISON · OWENS-ILLINOIS · WYANDOTTE CHEMICAL · BETHLEHEM STEEL · ALLEGHENY-LUDLUM · MEAD · DU PONT · DETROIT EDISON · ESSO · HERCULES POWDER · SINCLAIR PIPE LINE · GENERAL TIRE · MONSANTO

This *SUPER-SEAL* MOTOR application SAVED $3000!

Find out how much you can save

This application of a *Super-Seal* open-type motor — in place of a weather-protected design of the same rating — *saved the user $3000.00!*

You can achieve similar savings! Fill out the data sheet below and *find out for yourself how much you can save — on a "no-strings-attached" basis.*

Here's what to do: 1) Select an enclosed motor application in your operations (a new motor need or, for comparison, a motor just purchased); 2) fill out the data sheet; 3) mail to the address shown.

We'll give you a cost quotation on a *Super-Seal* open motor for that application.

Fill out this data sheet—

no strings attached—to find out how much you can save on a new motor or on an existing motor installation

To: **ALLIS-CHALMERS**
888 S. 70th St., Milwaukee 1, Wis.

Motor Data

1. Type (i.e., squirrel cage):

Horizontal ☐ Vertical ☐

Hp..... Rpm.....

2. Phase..... Frequency.....

Voltage.....

3. (For synchronous only)

Power factor.....

Starting torque.....

Pull-in torque.....

Pull-out torque.....

Application Data

4. Description of application:

5. Drive: Direct-connected ☐

V-Belt ☐ Other:.....

Starting load.....

Ambient temperature.....

6. Operating conditions:.....

Dirty ☐ Clean ☐ Wet ☐ Dry ☐

Other.....

Information on Existing Motors
(for comparison)

7. Type of insulation

Type of enclosure

Time rating.....

Temperature rise.....

Bearings:

Anti-friction ☐ Sleeve ☐

8. Special characteristics or construction:

NAME.....

TITLE.....

COMPANY.....

ADDRESS.....

A-5869

ALLIS-CHALMERS

WELLS LESS THAN a tenth as deep as Phillips' 1-EE University have been more troublesome. It took less than 2 hours to cement a 2,642-ft. liner suspended 12 ft. off bottom.

Deepest cement job is routine

. . . despite 380° F.

at 25,340 ft.

AMONG the records made at Phillips Petroleum Co.'s 25,340-ft. wildcat test in West Texas was the world's deepest cementing job.

This history-making cementing job performed on October 24, 1958, was relatively routine, due in part to the good mud program and hole condition maintained by Phillips and the successful application of Diacel cementing additives. Wells drilled to 2,500 ft. have presented more problems than did Phillips' 1-EE University hole.

The job was to cement a 2,642-ft. liner suspended 12 ft. off bottom. The liner was a tapered string of 5-in. 20.3-lb. and 18-lb. T-110 pipe. The cementing material consisted of 138 sacks of Trinity Inferno cement with 20% Diacel D and 3% Diacel LWL cement additives for a total of 355 cu. ft. of slurry.

One Halliburton Oil Well Cementing Co. Twin T-10 cementing trailer was used for pumping and displacing, with two others standing by. Two bulk transports were used for the cementing material.

The slurry, which weighed 12.3 lb. per gallon, was pumped at 2.4 bbl. per minute at an injection pressure of 2,800 psi. It required 21 minutes for the one truck to displace cement (injection rate was slowed to 1 bbl. per minute when the slurry reached the bottom of the liner).

Mud to displace cement was pumped at 2.4 bbl. per minute at 1,500 psi. for 83 minutes.

Including 6 minutes for releasing plug and setting liner, the entire operation required 1 hour and 50 minutes. This was over an hour less than the calculated pumpability of the slurry. Bottom-hole temperature was 300° F. circulating and 380° F. static.

After the job, a Halliburton Type C production packer was set at the top of the liner and the cement job successfully tested to 5,000 psi. for 45 minutes.

How to select and specify

ONE OF THE most important functions of the process design of petroleum or petrochemical plants is to provide basic requirements necessary for the selection of all major process equipment and important process controls. This information serves as the basis for the final, over-all specifications on the equipment, as developed by detailed engineering.

BY D. J. ORIOLO
Catalytic Construction Co.,
Philadelphia.

INFORMATION to be specified for process equipment will vary depending on the category of equipment involved. In all cases, the specifications should describe any special process requirements or any apparent deviation between the process flowsheet and the specifications.

Process specifications are influenced and guided in part by the minimum requirements on design, selection, and spacing of equipment, particularly in hazardous areas, as stipulated by insurance regulations; by local, state, and national codes; and by such organizations as API and ASME.

Specifications of ASTM are normally referred to as an index or measure of quality and workmanship on materials.

Standard Equipment

Most manufacturing and engineering contracting organizations use specific equipment data sheets or equipment schedules to send process and mechanical requirements necessary for the design and selection of equipment to meet required performances.

For items such as pumps, compressors, filters, centrifuges, and mixers, it is important to specify sufficient information on properties and characteristics of fluids handled, on operating service and on the performance expected of the particular equipment involved. In some instances, a specific make, type, and size of unit may be recommended, on the basis of pilot-plant experience or economic studies.

In all instances, materials of construction must be specified, or at least sufficient information must be presented on corrosive or erosive properties of materials handled.

Engineered equipment . . . Many organizations, such as engineering contractors, design essentially all of the vessels for a particular commercial facility. Before the vessel can be designed, process information must be supplied on the type; capacity; service conditions; number, size, and approximate location of nozzles and manholes, and the basic design of vessel internals.

Such information is normally supplemented with process sketches and sent to the vessel designer for his guidance in the definitive mechanical design of the equipment involved.

Package equipment . . . This includes special equipment or equipment completely designed, fabricated, or erected under a subcontract, ranging from manufactured package units to complete turn-key installations of process plants.

Specifications on such units must be quite rigid and must completely define and clarify responsibilities for all of the work involved.

Vessels

Vessel designs can vary widely and generally cover receivers, storage tanks, accumulators, and chemical reactors such as autoclaves and fractionators. Additional information covering pertinent specifications for fractionators (both tray and packed columns) is discussed later. Here are some of the important process specifications to consider, depending on the vessel requirements:

1. Type and position (vertical or horizontal, whether mounted or not).
2. Operating capacity, gallons (minimum to maximum range).
3. Operating temperature, °F. (minimum to maximum range).
4. Operating pressure, psig. or mm.

process equipment

Hg (minimum to maximum range).

5. Dimensions (if critical to process).

6. Service—Include pertinent physical properties of fluids depending on service. For example, if fluid is agitated, show viscosity and density and solids content of fluid or fluids agitated and indicate type of agitator required. State whether toxic or flammable materials are involved.

7. Heat transfer—Indicate whether vessel has internal coils, electric heaters, or heating jacket for heating or cooling purposes. Specify such items as heating medium, drying rates, heat flux, heat-transfer-area requirements, allowable pressure drops in coils or jackets, and flow of materials.

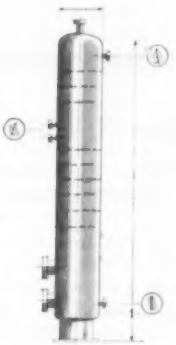
8. Materials of construction—Based on experience and actual performance data for fluids involved.

9. Corrosion rates (if available)—This is important for specifying minimum corrosion allowances.

10. Insulation—Indicate process requirements.

11. Connections — Indicate important connections and sizes, when critical, such as inlet and outlet connections, and agitator openings.

12. Internals — Indicate type and arrangement of baffles, or any special internal design.



Distillation Towers

Towers for separating components by distillation, fractionation, absorption, stripping, and extraction may vary considerably in design, particularly with respect to internals.

As the first step in the design and selection of equipment, such as a fractionator, it is necessary to make complete material and heat balances for the components to be separated; calculate the number of theoretical stages required for the separation; and estimate the diameter and over-all height of the column based on allowable vapor velocities, tray spacing, and over-all expected tray efficiency. Basic process requirements which must be specified are as follows:

1. Service
2. Materials processed:
(a) description
(b) molecular weight
(c) liquid density, viscosity, and surface tension at operating conditions
(d) vapor density at operating conditions
3. Maximum liquid loads (g.p.m. or lb. per hour) at tower top and tower bottom
4. Maximum vapor loads (cu. ft. per second or lb. per hour) at tower top and tower bottom
5. Operating pressure and allowable pressure drop through tower
6. Operating temperatures at feed, top, and bottom of tower
7. Number and spacing of theoretical trays in the enriching and in the stripping sections
8. Over-all tower and tray efficiency
9. Internal column diameter
10. Materials of construction, including minimum corrosion allowance
11. Number, size, and approximate location of major inlet and outlet nozzles; skirt length.

The selection of the type of internals to use is influenced by a consideration of service and capacity requirements, physical and chemical characteristics of fluids to be processed, on materials of construction which are required, and on the process, equipment, and economic limitations involved.

Tower internals may comprise packing materials of various sizes and shapes, bubble-cap trays, perforated or sieve trays, and patented or special designs, such as Turbogrid, Kaskade, and Unifex trays.

Packing may be considered for a tower when a low pressure drop and a low operating holdup are desired or when corrosive materials are to be processed. Packed columns are generally limited in application to units of 2 to 3 ft. and smaller in diameter, primarily because of the lack of design information adequate for scaleup to larger sizes.

The cost of packing, including supports and redistributors, may become too high for large-diameter towers,

CODES AND STANDARDS RELATIVE TO VESSELS, TANKS, AND BOILERS

Equipment	Service	Applicable Code or Standard
1. Pressure vessels	For all services up to 3,000 psi.	ASME
2. Unfired pressure vessels	For all services	ASME
	For marine work	American Bureau of Shipping (ABS); U. S. Bur. of Marine Inspection and Navigation, Lloyds of London
3. Boilers	For power, low-pressure heating, and miniature boilers	ASME
	Locomotive boilers	ASME; ICC
	Marine boilers	ABS, U. S. Bur. of Marine Inspection and Navigation, Lloyds of London
4. Tanks	For general petroleum refining service	API
	Car tanks, truck tanks	ICC
	For water storage	American Water Works Assoc.
	For storage of fire-protection water and for storage of flammables	Underwriter's Laboratories: National Bureau of Fire Underwriters; Associated Factory Mutual Fire Insurance Companies
	For storage of hazardous chemicals (acids, organics, etc.)	Manufacturing Chemists Association

as compared to bubbletrays. To minimize channeling, packing material is chosen so that the ratio of tower diameter to packing diameter is always greater than 8 to 1.

Bubble - cap trays . . . Bubble - cap trays are popular and have a wide application. For columns below about 2 ft. in diameter, however, such trays may become difficult and expensive to install. An excellent coverage of the many factors to consider in designing and selecting bubble-cap trays is treated elsewhere ("Optimum Bubble-Cap Tray Design" by W. L. Bolles, Pet. Proc., Feb. through May 1956).

In many instances, a particular organization may prefer to handle the complete process, mechanical, and structural design of a fractionator, with complete bubble-cap tray layout and assembly, including type, size, number, and dimensions of caps, risers, downcomers, weirs, and tray supports.

To take advantage of the fabricator's optimum design which meets process requirements, the specification would specify, in addition to the basic process requirements enumerated above, the percentage of tower area to be allotted for slot, uptake, and reversal areas and generally some pertinent aspects regarding the number and size of caps required.

Compressors

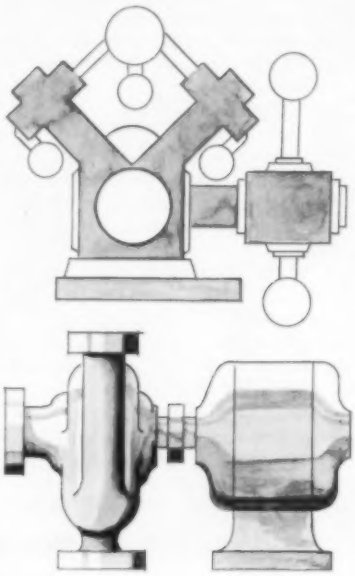
Compressors may be classified into the following general categories, each of which is suitable for service in single-stage, two-stage, or multiple-stage compression of gases:

1. Positive-displacement type
(a) reciprocating compressors
(b) rotary compressors, cycloidal, sliding vane, hydraulic piston, eccentric roller
2. Centrifugal type, radial flow, axial flow.

The performance of compressors, whether of the positive-displacement or centrifugal type, is influenced by the characteristics of the gas handled. This is particularly true of centrifugal compressors. When considering centrifugal compressors for handling gas mixtures whose composition may vary over a wide range, the specification should give accurate information on the expected changes in gas analysis, specific gravity, molecular weight, and "K" value (ratio of specific heats—Cp/Cv).

Other factors which must be specified include (a) intake capacity, (b) number of compression stages, (c) temperatures and pressures at the intake and discharge of each stage, (d) altitude above sea level, (e) the type of drive desired and, (f) whether the installation is to be indoors or outdoors.

It is also important to specify materials of construction and, as a minimum, to describe whether the gas to be handled is corrosive and/or erosive, including information on the amounts and characteristics of any dust or entrained liquids which may be present. Mention should be made of any special or abnormal condition which could occur in startup or shutdown or in the event of major operating upsets.



Drivers

For power, an electric motor, steam turbine, combustion gas turbine, or expansion turbine may be used to drive a compressor. The type of drive to use is dependent on process and economic considerations of the utilities and other sources of energy available for a particular plant installation.

For a motor drive, the electrical characteristics must be specified (cycles, phase, voltage) and the type of motor should be indicated (explosion-proof, totally enclosed, dripproof, weatherproof, etc.), depending on the nature or hazard of the gas-compression service involved.

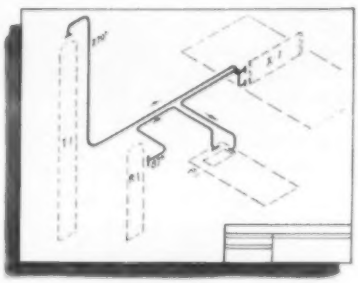
For a steam-turbine drive, it is necessary to specify complete conditions for steam inlet and steam exhaust. The summer temperature and pressure of the cooling water supply should also be stated. For a combustion gas drive, specify the type of gas, its pressure, and its heating value in terms of B.t.u. per cubic foot.

Pumps

The two basic classes of pumps are (1) centrifugal types and (2) positive-displacement types, such as reciprocating, rotary, or diaphragm. Pumps of the turbine or mixed-flow type have characteristics which are a mixture of both the centrifugal and positive-displacement type of pump. As a guide to minimum standards for the design and selection of centrifugal pumps for general refinery service, reference should be made to API Standard 610.

In selecting a pump, it is important to indicate the type of pump and pump drive required and to specify the service, characteristics of fluid handled, capacity and hydraulic requirements, materials of construction best suited for the service, type of pump seal, and whether the pump is to be horizontal or vertical.

Sufficient information must be given to adequately describe whether the material to be pumped contains dissolved gases, or is corrosive or contains suspended solids which are abrasive. Some types of pumps cannot be made in certain materials of construction and some which may be suitable processwise, may be too expensive for a particular application.



Specified Data

For specified data, when possible it is best to prepare schematic sketches of the pumping system and provide sufficient information for calculating static heads, pipe friction losses in suction and discharge lines, and the available net positive suction head (NPSH). The available NPSH should not be too low (less than 5 to 10 ft.), otherwise expensive, specially designed pumps would be necessary.

The important conditions which should be specified may be listed as follows:

1. Service
2. Material pumped, including physical and chemical characteristics
3. Normal and design capacities: Generally design capacities are 10-

25% above normal expected flows (10% for storage handling and 15-25% above normal for process flows to operating units).

4. Pumping temperature (P.T.)
5. Specific gravity at 60° F. and at P.T.
6. Viscosity at 60° F. and at P.T.
7. Vapor pressure at 60° F. and at P.T.
8. Operating pressure of vessel serving pump suction
9. Static suction head or static suction left
10. Available NPSH
11. Total dynamic discharge head at P.T.
12. Altitude above sea level

Agitators

Mixing of fluids is generally done with mechanical agitators contained within vessels which are operated on either a batch or continuous basis. Such agitators are used for a variety of services, including (1) blending or emulsification of liquids, (2) dissolving or suspension of solids in liquids, (3) absorption, dispersion, or scrubbing of gases in liquids, (4) reactions, such as continuous hydrogenations wherein hydrogen gas is contacted with a liquid mix containing suspended nickel catalyst and, (5) various processing and heat-exchange steps.

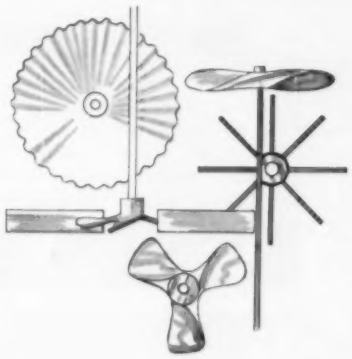
There are many kinds of mechanical agitators, differing basically in the type and arrangement of the impeller on the drive shaft. Impeller types include anchors, gates, propellers, radial propellers, paddles, turbines, cones, disks, and various special designs, each producing its characteristic flow patterns.

Criteria . . . It is difficult to select the best type of agitator for a given service, particularly since there are no fixed criteria to calculate and establish agitator performance, as evidenced by the fact that manufacturers will sometimes disagree on the best type and size of agitator equipment to use for a particular application.

Whenever possible, it is highly desirable to submit samples for testing by manufacturers of agitators. These manufacturers have specialized knowledge and experience and can provide good advice and recommendations, particularly on the scaleup of laboratory or pilot units to commercial-size equipment.

It is important that complete mixing requirements be specified, particularly if it is not possible to submit samples for testing. The service, the kind and size of agitator, the power consumption, the size and shape of vessel, the extent of baffling and other required accessories, and materials of construction are all factors pertinent to the selection of agitators.

It is good practice to provide a drawing of the vessel which is to contain the agitator, giving adequate information on tank design and dimensions, mounting clearances and any limitations on space, internals such as baffles and coils, desired materials of construction, and whether vessel is to be installed indoors or outdoors.



Motor Characteristics

The type of motor and electric-power characteristics should be indicated. The following information on operating conditions and physical characteristics of fluid handled should be specified:

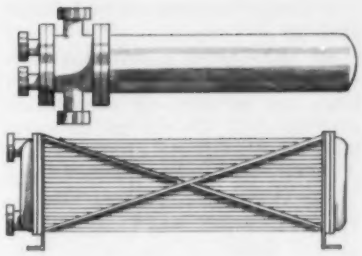
1. Describe whether operation is to be batch or continuous. For continuous operation, give the flow rates of materials entering and leaving the vessel and indicate operating temperatures, pressures and, maximum and minimum levels to be maintained.

For batch operation, list the range of batch sizes anticipated; the cycle times, temperatures, and pressures during charging, mixing, and discharging; and indicate whether the agitator is to be in operation during charging and during discharge of the batch. Give the total hours of batch service per day.

2. If performance information is available, describe the degree of agitation required, such as, mild, intermediate, or violent.

3. Provide information at operating temperatures on the density, viscosity and composition of the mix and of the components which make up the mix. Describe any special points, such as whether the mix tends to foam.

4. If the mix contains solids, indicate the concentration of solubles or insolubles, and give data on the particle size, density, and settling velocity of the solids. Indicate whether the solids are abrasive.



Heat Exchangers

Most industrial heat exchangers are of the tubular type and are rated, designed, and constructed in accordance with criteria recommended by "Heat Exchanger Institute" and by "Standards of Tubular Exchanger Manufacturers Association" (TEMA). TEMA standards cover the following three classes of construction:

TEMA Class R—For severe service requirements in petroleum refineries and similar applications, such as petrochemical plants.

TEMA Class C—For maximum economy and over-all compactness in commercial and general process applications.

TEMA Class A—For general services requiring alloys and special materials of construction.

Spec sheet . . . The TEMA exchanger specification sheet is normally used for specifying the physical characteristics, the basic process requirements and the expected thermal performance for fluids handled in both the tube side and shell side of tubular exchangers, as illustrated below:

1. Fluids circulated (tube side and shell side):
(a) Throughputs, pounds per hour or gallons per hour.
(b) Physical state—vapor or liquid; vapor-liquid mixture; liquid containing solids in suspension.
(c) Corrosive and erosive properties of fluids handled, including minimum corrosion allowance.
(d) Specific gravities.
(e) Viscosities.
(f) Specific heats.
(g) Latent heats.
(h) Thermal conductivities.
2. Inlet and outlet temperatures of each fluid.
3. Operating pressures.
4. Pressure drops — state whether minimum or maximum requirements.
5. Velocities—state whether minimum or maximum requirements.
6. Number of tube passes—specify this factor if critical.
7. Heat flux requirements, B.t.u. per hour exchanged, including any safety factors.
8. Fouling factors.

9. Design temperatures and design pressures.

10. Materials of construction—galvanic corrosion could occur when tubes are of different construction than the shell. Do not use dissimilar metals and alloys indiscriminately.

Certain generalities are useful and applicable in selecting tubular heat exchangers. Fluids which contain suspended solids, or are corrosive, or have the greatest tendency to foul, or are at the highest pressure, are generally maintained inside the tubes. The allowable pressure drop has an important bearing on both exchanger costs and pumping costs.

The heat-transfer rate increases with increase in pressure drop and any savings effected in exchanger costs as a result of increased fluid circulation must be balanced against the required increase in pumping costs.

Furnaces

Furnaces, either oil-fired or gas-fired, are used in the petroleum and petrochemical industries for a variety of reasons, including thermal cracking and treatment of oils and hydrocarbons. The detailed mechanical and structural design of furnaces requires considerable specialization and is beyond the scope of most process engineers involved in plant design. Before the furnace can be selected or designed, however, it is necessary to specify the basic process and performance requirements.

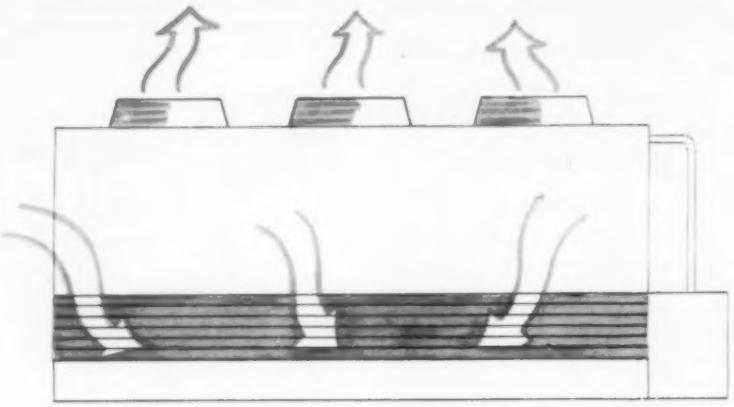
In addition to determining operating conditions necessary to achieve a specific product from a given feed stock, it is necessary to specify the physical and chemical characteristics of the feed stock and of the products derived therefrom, including analyses, densities, and viscosities over the desired temperature range, coking tendencies, and molecular weights of the vapors involved or resulting from the thermal treatment.

Tube data . . . The dimensions of the tubes—diameter and length—to use for a particular reaction can usually be estimated from either kinetic data or from "experience" factors.

Conditions of operation would include data on (1) flow rate of feed stock, including temperatures and pressures and the extent of vaporization at inlet and outlet of tubes, (2) heat duty in B.t.u. per hour absorbed, (3) the allowable pressure drop through the tubes, (4) the maximum operating temperatures and pressure within the tubes and, (5) the desired furnace efficiency, based on certain excess-air usage.

If the heat flux (per unit tube surface or unit furnace volume) or velocity of flow through the tubes are critical, these factors should be specified. Also it is desirable to specify corrosion data, if available, and any features which may be necessary relative to space limitations or special burner considerations, or to requirements for exhausting flue gases, such as through natural-draft stacks.

For a gas fuel, information should be given on its composition, net heat of combustion, density, and temperature and pressure at the furnace inlet. Additional information on viscosity would be required for a fuel oil. In all cases, the amount of excess air must be listed.



Cooling Towers

Towers for cooling water are either (1) the natural-draft type which uses natural wind movement to cool water or, (2) the mechanical-draft type which uses one or more forced-draft or induced-draft fans to create air movement. Most industrial cooling towers are fabricated and tested in accordance with standards and recommendations of the Cooling Tower Institute. The following information is basic to the rating, performance, and selection of a cooling tower:

1. Type—Specify whether natural or mechanical type.

2. Capacity—Give the quantity of water entering the tower as g.p.m. or B.t.u. loading.

3. Characteristics of water — Give source and analysis of water, if available, including concentration of suspended solids and other contaminants, and any data on its corrosive properties.

4. Water temperatures — Give the maximum temperature of the water entering the tower and the desired temperature of the cold water leaving the tower.

5. Wet-bulb design temperature of ambient air—This is usually taken to be somewhat above the average of the three hottest months of the year.

6. Approach—Approach is defined as the cold-water temperature minus the design wet-bulb temperature. The closer the approach to wet-bulb temperature, the larger will be the cooling tower. An approach less than 5° F. is seldom employed.

7. Entrainment loss—This is generally limited to a loss equivalent to less than about 0.25% of the water circulated.

8. Winds — State the maximum wind velocity and prevailing direction.

9. Materials of construction—Give preferences, including alternates.

10. Fan drive—Give the type of drive desired, including characteristics of power available, and any limitations on noise levels.

11. Location — State geographical location, elevation above sea level, and pertinent data regarding area available, including proximity to adjacent equipment and structures. (A sketch is helpful.)

Evaporators

Evaporators vary with respect to body design, arrangement of heating surfaces, and other construction features, depending primarily upon the particular application. The heating surfaces generally consist of tubes with the heating medium, such as steam, on the inside or outside of the tubes. Evaporators may be of the natural-circulation, forced-circulation, or falling-film type. The heating surface may be of the horizontal-tube, vertical-tube, calandria, or basket design.

Evaporators are used in batch or continuous service for concentrating liquids, some of which may precipitate crystals during the concentration. Either a single unit or a number of units (multiple effect) may be em-

"For crystallizing solutions, it is helpful to have data on solubilities at various temperatures and saturation temperatures for the components of interest in the evaporator liquor."

ployed, with either forward or backward feed.

It is generally desirable, particularly for new applications, to perform tests in prototype units furnished by manufacturers of evaporation equipment. Such tests should be conducted with the object of ascertaining (1) the type and amount of heat-transfer surface required, (2) whether heat-transfer surfaces become fouled by deposition of solids, (3) means for achieving minimum entrainment in the overhead vapors, (4) means of overcoming possible foaming or slurry-handling problems, (5) proper instrumentation to employ and, (6) proper type of pump and pump drive and other accessories to use.

The following basic conditions should be specified when selecting evaporators:

1. Type of operation—State whether operation is to be batch or continuous; whether natural circulation, forced circulation, or other types are desired; and number of effects to be employed. Give the number of hours of operation per day so that manufacturer can establish the proper cycle for operation and for maintenance cleanout, when required.

2. Capacity—State this in terms of flow rate of feed or total daily quantity of feed to the evaporator or in total hourly or daily quantity of overhead to be evaporated.

3. Concentrations — Give amounts of solids in the feed and the amount of solids expected in the effluent, both dissolved and suspended. Indicate characteristics of the suspended solids and the expected treatment of the solids following concentration.

4. Temperatures — Give the feed-liquor temperature and desired effluent temperature. If the liquor is sensitive to higher temperatures, give the highest temperature allowed during evaporation.

5. Entrainment — State limitations and other requirements.

6. The material to be evaporated should be described, giving its foaming and scaling characteristics, and its composition including soluble and insoluble components, plus impurities. Describe whether the material is acidic, alkaline, or neutral and whether it is hazardous (flammable, toxic, or explosive).

7. For the initial conditions of the feed and for final conditions of the concentrated liquor, specify the following data for the particular operating temperatures involved: (a) per cent total solids, (b) specific gravity, (c) viscosity, and (d) boiling point at atmospheric pressure.

8. If available, provide boiling-point data over a range of vacuum and pressure conditions for both the feed and evaporator liquid at various levels of solubles content.

9. For crystallizing solutions, it is helpful to have data on solubilities at various temperatures and saturation temperatures for the components of interest in the evaporator liquor.

10. Provide corrosion data, if available, and state preferred materials of construction. Note whether any metals are known to contaminate or in any way adversely affect the liquor to be concentrated.

11. Give information on (a) available pressure of steam for evaporation use and of steam for accessories, (b) source, pressure, and minimum and maximum temperatures of cooling water, and (c) characteristics of electric current for motors.

12. List any special requirements or preferences relative to pumps, condensers, vacuum facilities, instrumentation, and maintenance or cleaning-out schedules.

13. Provide a sketch of equipment pointing out any existing space limitations or equipment interferences, and stating whether unit is to be indoors or outdoors.

Part 2 of this article will appear in the Journal next week.

CO boiler . . .

being constructed by Shell Oil Co. at its Wilmington, Calif., refinery features techniques for making the catalytic cracker more efficient.

BY W. L. NELSON, Technical Editor and Petroleum Consultant

Optimum pressure for vacuum distillation . . . *and amount of steam required*

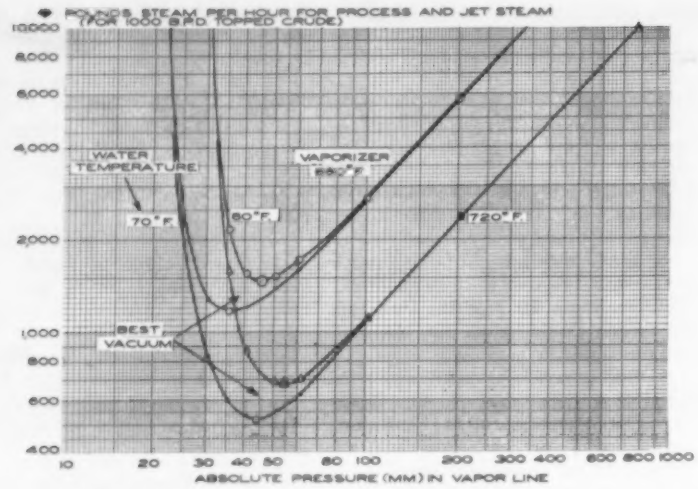
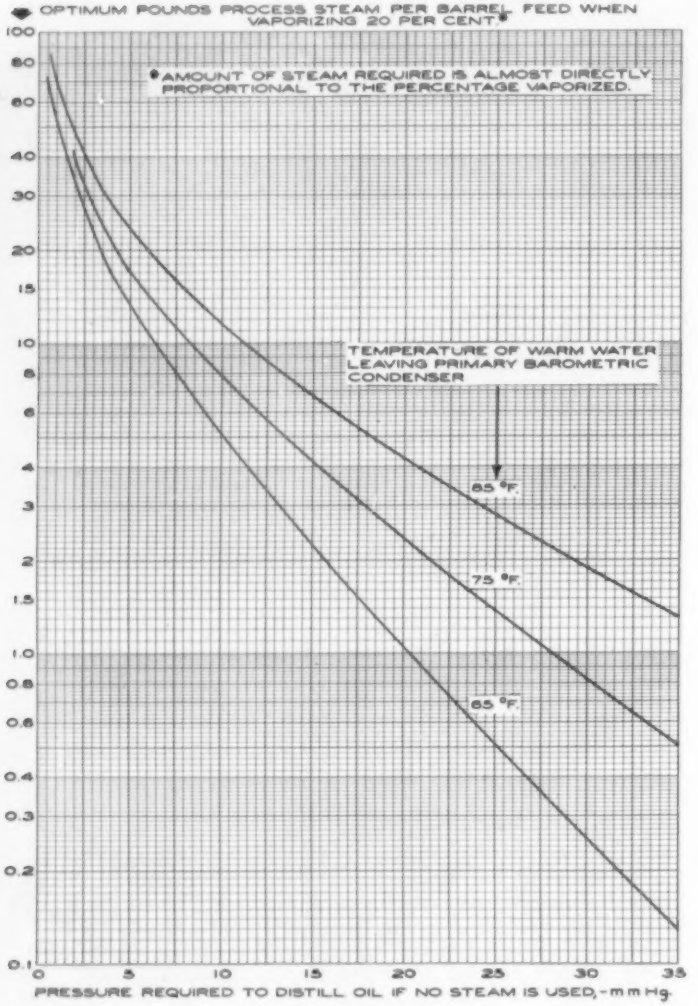


ILLUSTRATION of optimum pressure for vacuum distillation. Fig. 1.



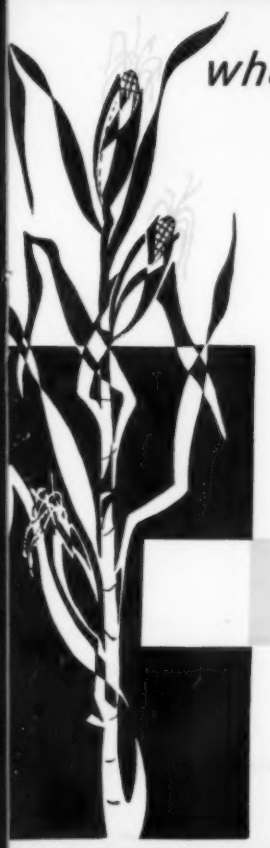
AMOUNT of process steam required for conventional topped crude oils when operating at the optimum pressure. (Vaporizer at 670° F.) Fig. 2.

FOR EACH vaporizer temperature, each distillation-range stock, and each cooling-water temperature, there is an optimum operating pressure as indicated in Fig. 1 (OGJ, May 14, 1956, p. 171) which requires the least amount of process and jet steam. The optimum pressure is always close to the lowest pressure that can be produced by the steam jets for the temperature of the cooling water available. A number of computations indicate that the optimum pressure is equal to the (1) lowest pressure possible at the barometric condenser, plus (2) the pressure drop through the condensers (if any), vapor line and tower, back to the vaporizer section, and plus (3) three to 7 mm. more (the 7 mm. being for large percentages of oil vaporized and the relatively high pressures of 30-50 mm.). Thus, optimum pressures are mainly a function of outlet water temperature:

Outlet water, °F.	Optimum pressure, mm. Hg.
65	23 plus △ P
75	32 plus △ P
80	36.5 plus △ P
85	42 plus △ P
90	50 plus △ P

The amount of jet steam required can be obtained from Fig. 1 of Process Costimating No. 34 (Dec. 8, 1958, p. 93). The amount of process (or partial pressure reduction) steam from Fig. 2 here. Cooling-water temperature does not directly affect the amount of process steam but indirectly, as indicated in Fig. 2, it changes the optimum operating pressure and thus the process steam required. Although Fig. 2 is based on the vaporization of 20 liquid volume per cent of the feed, other amounts of vaporization can also be obtained because the amount of process steam is directly proportional to the amount vaporized.

The pressure required to distill the oil with no steam (see base scale of Fig. 2) is obtained by reducing the temperature on the flash vaporization curve to the desired vaporizer temperature using vapor pressure charts such as those on pages 206-208 of the fourth edition of Petroleum Refining Engineering.



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4. Development of neutron-derived porosity curve

BY E. T. GUERRERO
Head, Department of Petroleum Production Engineering, University of Tulsa

and

F. M. STEWART
Staff Engineer, Alex McCoy Associates, Inc.

GIVEN: Core-analysis porosity measurements and neutron log for a 53-ft. interval in a limestone formation.

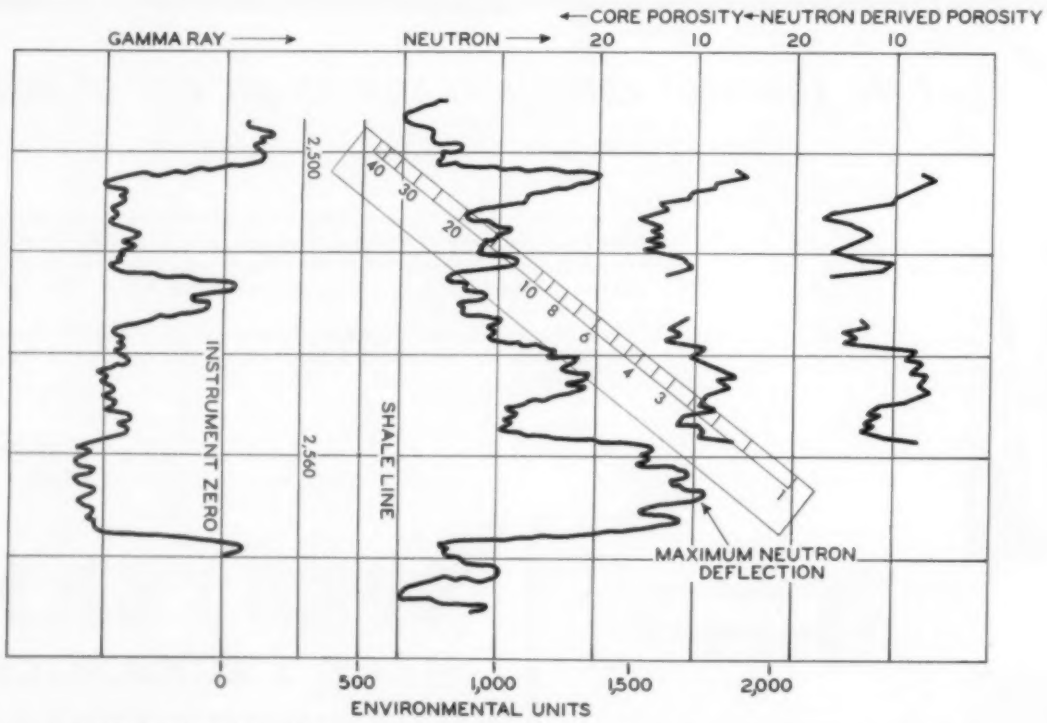
FIND: Neutron - derived porosity curve.

METHOD OF SOLUTION: The following describes the stepwise procedure of solution:

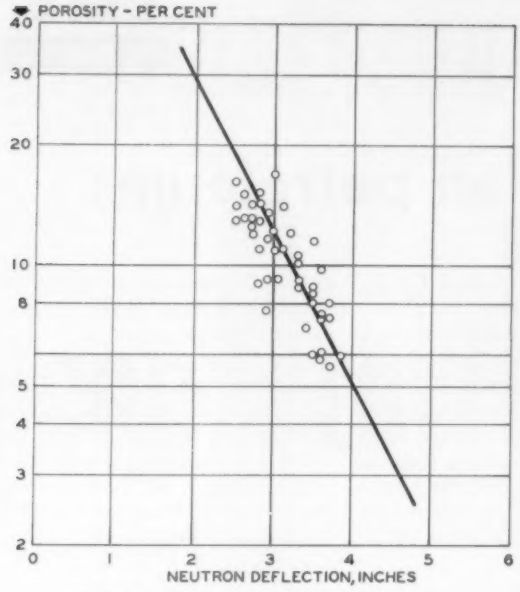
1. Establish an instrument zero line on the log. Fig. 1.
2. Plot gamma-ray and neutron curves on 10 by 10 cross-section paper. Fig. 1.
3. Plot core porosities on 10 by 10 cross-section paper using a scale arranged opposite to that of the neutron log. That is to say high-porosity readings will correlate with low neutron values. Fig. 1.
4. Correlate the plotted porosity curve with the neutron curve and note core-depth adjustment to neutron curve. Fig. 1 and Table 1.
5. Record opposite each core depth and corresponding porosity the actual depth and neutron deflection in inches. Table 1.
6. Plot neutron deflection on two-cycle semilog paper versus porosity. Fig. 2.
7. Draw a straight line through the plotted points. Fig. 2.

The initial gamma-ray and neutron curves are plotted on 10 by 10 cross-section paper. Core porosities are plotted on similar paper with porosities increasing from right to left, and correlated with the neutron-log plot by adjusting vertical scale upward or downward as required. When the correlation has been made, all data are transferred to a single sheet of cross-section paper, as in Fig. 1. This adjustment in depth is necessary because log depths and core depths usually do not coincide, and the log depth is considered the more accurate of the two.

Once this correlation is made, the neutron deflection corresponding to each core porosity is read (in inches or any other convenient unit) from the instrument zero line and recorded in Table 1. From these data a plot of core porosity and neutron deflection is constructed as shown in Fig. 2. The same neutron deflections can then be used to read porosity values from the curve, Fig. 2, to give the neutron-derived porosity correlation shown in



RADIOACTIVITY LOG with core and neutron-derived porosities for limestone formation. Fig. 1.



NEUTRON-DERIVED porosity curve. Fig. 2.

Fig. 1, the data for which are tabulated in Table 1.

DISCUSSION: Research technologists have well established that the response recorded by the neutron curve is inversely proportional to the number of hydrogen atoms present in the vicinity of the instrument. Hydrogen atoms are contained in oil, gas, distillate, and water. The amount of these fluids present in clean formations traversed by a borehole is in turn dependent on the existing porosity. A high porosity (30 to 40%) would mean a high fluid and hydrogen-atom content and the neutron log would record a low value. A low porosity (5 to 10%) would mean a small fluid and hydrogen-atom content and the neutron log would record a high value. Presence of borehole fluid also affects the neutron values. However, if this is kept constant, variations in formation porosities can be detected.

TABLE 1—CORE ANALYSIS AND NEUTRON-LOG DATA

Actual depth, ft.	Core depth, ft.	Porosity %	Neutron deflection, in.	Neutron derived porosity, per cent
2504	2498	6.0	3.5	7.3
05	99	6.0	3.8	5.7
06	2500	8.1	3.7	6.2
07	01	8.6	3.5	7.3
08	02	10.3	3.3	8.6
2509	2503	11.0	3.1	10.2
10	04	14.0	3.1	10.2
11	05	13.0	2.8	13.0
12	06	14.0	2.5	16.6
13	07	16.0	2.5	16.6
2553	47	11.8	2.9	12.0
54	48	9.3	2.9	12.0
55	49	9.0	2.8	13.0
2556	2550	9.3	3.0	11.1
57	51	5.9	3.6	6.8

The neutron response is affected by both chemically combined (water of crystallization) and free fluids. Shales normally exhibit the greatest amount of chemically combined and free fluids and thus show the lowest values on the neutron curves. Limestones and dolomites often have very low porosities and show high values on the neutron curve.

This method of porosity determination depends on the interrelationships that normally exist among neutron deflection, fluid content, and porosities. It also depends strongly on good core recovery and analysis. The idea is to select a representative well or wells in a field or area and to develop a neutron-derived porosity curve that can, in turn, be used for porosity determinations in subsequent wells. Thus in any subsequent well in which a neutron log was obtained, the neutron deflections (in the formations of interest) could be referred to the neutron-derived porosity curve and the respective porosities noted. It is apparent from this that the neutron-derived porosity curve must be representative of the field or area under study. Furthermore, the neutron logs from any subsequent wells must have been obtained under conditions of the same hole size; same casing type, and size; and in the same type of mud used in the base well. Wherever any or all of these conditions differ, then a new base curve would be required. Consequently, following the procedure outlined, several base curves (to satisfy varying conditions of hole size, casing size, and type of drilling fluid used) may be required for a field or area.

Statistically, an average porosity for medium to thick intervals of similar rock characteristics derived by this method should be fairly reliable. However, porosity determination is quite sensitive to several factors as discussed above, particularly hole size. Since hole size can vary considerably within a given well or from well to well even when the same size bit is used, the porosity determination for a point or a thin layer by this method may be subject to considerable error unless corrections for these variations are taken into account.

It is possible, by using a simplified procedure, to refer all neutron logs to base curve although well hole and casing sizes may have varied. The technique here is to use a logarithmic scale reading from 1 to 44. From the base curve establish a representative porosity value for the shale line (35.0% for the example given) and a representative porosity value for the maximum neutron deflection value (2.5% for the example given). Thus placing the 35% reading of the scale on the shale line and the 2.5% reading on the maximum deflection line, Fig. 1, porosity values can be read for any deflection in between.

And for the neutron logs of any subsequent wells in the area it would only be necessary to locate a shale line that is equivalent to shale used in the base well and similarly maximum neutron deflection line. On these the scale would be used as described for the base log. Any differences caused by hole size, casing size, or type of fluid would be compensated for by the slope assumed by the scale.

Porosity determination from neutron logs has been found to have good applicability in carbonate-type formations and for clean sandstones. In formations containing shale and other similar impurities, the method is less reliable because of the chemically held water that is characteristic of these formations.

Study of neutron-derived porosity curves indicates that they actually may be S-shaped instead of straight lines with the deviations from a straight line occurring above 25% porosity and below 5% porosity. This would tend to make the shale-line porosity higher and the maximum-deflection porosity lower than indicated by the straight line. In the normal usage of a neutron porosity scale shales are frequently assigned a porosity value of 40% and the maximum neutron deflections a porosity value of 1 to 2%.

Acknowledgement . . . The authors thank S. W. McGaha, Lane Wells Co., Tulsa, for his assistance and review of this problem.

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BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Metals in Venezuelan petroleums

In your answer of December 22, 1958, you show the metal content of many crude oils of the United States and a few oils outside the United States. What about the Venezuelan crude oils that are now being imported? S.T.M.

Venezuelan crude oils and their metal contents are shown in Table 1. Consult Questions on Technology of December 22, 1958, for data on California, Texas, Miscellaneous U.S.A., and Foreign crude oils.

When oils of the same gravity are compared, more metals are present in Californian and Venezuelan petroleums than in other oils and the least amounts of metals are found in highly naphthenic oils such as those of the Gulf Coast area of the United States. With regard to fluid-process catalyst, nickel is the worst of the metals. Californian oils contain the largest amounts of nickel, Venezuelan oils contain one-third to one-sixth as much, and most other oils contain very little nickel. Venezuelan oils contain the largest amounts of vanadium.

The references designated by numbers in Table 1 are the same references listed in December 22, 1958, Questions on Technology.

TABLE 1—METALS IN VENEZUELAN PETROLEUMS

Name of crude oil—	API	Wt. % ash	P.p.m. of metals V	Ni	Fe	Cu	Na	Cr	Approx. p.p.m. of vanadium in 900°+ F. residue	Ref.
Bachaquero	15.1	.....	348	45	.....	.....	.....	.....	680	1
Bachaquero	12.8	0.082	320	42	3.9	0.2	11.0	0.08	580	2
Boca	30.7	0.027	48.5	.....	.....	.....	.....	.....	216	2
Boscan	10.1	0.19	1,200	150	60.0	3.0	.....	1.0	1,820	2
Boscan	10.6	.....	1,100	105	6.2	.....	.....	.....	1,770	3
Boscan	9.8	0.22	1,150	.....	.....	.....	.....	.....	1,740	2
Cantaura	40.7	0.012	0.6	.....	.....	.....	.....	.....	8	2
Centro del Lago	31.0	.....	179	30	32.0	.....	.....	.....	595	2
Esquina	39.3	0.0026	2.5	.....	.....	.....	.....	.....	21	2
Esquina	40.7	0.0011	1.3	.....	.....	.....	.....	.....	16	2
Guario	44.4	0.008	1.9	.....	.....	.....	.....	.....	24	2
Guico (3 samples)	33-35	0.009-0.021	17-68	.....	.....	.....	.....	.....	106-360	2
Jusepin	32.0	.....	16.8	.....	.....	.....	.....	.....	70	3
Jusepin	32.9	0.016	14.8	2.0	4.7	.....	27.6	.....	62	4
La Ceibita	37.3	0.0025	0.66	.....	.....	.....	.....	.....	3	2
Lagunillas	17.4	.....	265	35.0	.....	.....	.....	.....	575	1
Lagunillas	17.6	.....	236	.....	.....	.....	.....	.....	515	3
Lagunillas	*16.0	0.133	305	.....	.....	.....	.....	.....	650	11
Lagunillas	25.7	0.0348	116	8.2	0.97	.....	22.5	.....	283	4
Lagunillas	26.3	.....	151	.....	.....	.....	.....	.....	378	3
Lagomar	31.0	0.040	179	22.0	8.4	.....	8.9	.....	540	2
Lama (7 samples)	29-36	.....	8-26	.....	.....	.....	.....	.....	33-76	2
La Rosa	25.6	.....	185	.....	.....	.....	.....	.....	500	3
La Rosa	25.7	0.0394	156	10.0	0.83	.....	37.0	.....	420	4
Mapiri (3 samples)	33-35	0.007-0.011	11-14	.....	.....	.....	.....	.....	65-67	2
Mara	29.3	0.037	173	16.3	0.8	.....	.....	.....	567	2
Oficina	26.7	.....	129	.....	.....	.....	.....	.....	326	3
Oscurote (2 samples)	28-30	0.0057-0.0158	20-68	.....	.....	.....	.....	.....	100-270	2
Oscurote, Norte	18.3	0.069	187	.....	.....	.....	.....	.....	390	2
Quiriquire	19.0	.....	39	.....	.....	.....	.....	.....	130	3
Quiriquire	19.3	0.0236	31.3	5.9	2.0	.....	17.5	.....	112	4
East Ruiz	30.1	0.042	111	.....	.....	.....	.....	.....	480	2
San Joaquin	41.1	.....	2.3	0.9	.....	.....	.....	.....	21	1
San Joaquin	40.6	0.016	2.4	32.0	13.1	0.22	1.18	0.024	22	2
San Joaquin	41.5	.....	11.2	2.0	.....	.....	.....	.....	102	3
San Joaquin	45.5	0.0005	0.33	0.14	0.45	.....	1.1	.....	4	4
San Roque	*41.0	.....	(†)	.....	.....	.....	.....	.....	40	10
Tarra	38.1	0.010	42.0	6.6	0.49	0.10	6.0	0.009	240	2
Tia Juana, Medium	25.6	.....	185	.....	.....	.....	.....	.....	475	3
Tia Juana, Medium	26.7	0.0388	134	7.6	2.44	.....	41.2	.....	350	4
Tia Juana, Heavy	16.5	.....	269	.....	.....	.....	.....	.....	510	3

*Estimated API gravity upon which vanadium in residue is based. †Under 5.6.

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GOOD LOW COST JOB!

GUIBERSON'S Type J

Type L

Type GW

Here are three swabs capable of swabbing all sizes of tubing and drill pipe — in a minimum of time — making them most economical and efficient for routine swabbing. Many other types of Guiberson cups are immediately available for *specific* and *unusual* swabbing problems.

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Everywhere

Call Bethlehem for Flanged and Dished Heads

Bethlehem makes flanged and dished heads to meet virtually every requirement. The types we produce include ASME Code, elliptical and standard flanged-and-dished. Also flanged-only, dished-only, shallow-dished, double-dished, and heads for special requirements.

Bethlehem heads come in diameters up to 144 in. They are made in thicknesses from 14 gage to 2½ in. Bethlehem also produces standard manhole and hand-hole saddles, covers and fittings, and also heads with flued openings.

A number of sizes of ASME Code flanged-and-dished heads are stocked for prompt delivery.

A letter or phone call to the nearest Bethlehem sales office will bring you a copy of our stock list. Or write to us direct at our offices at Bethlehem, Pa.

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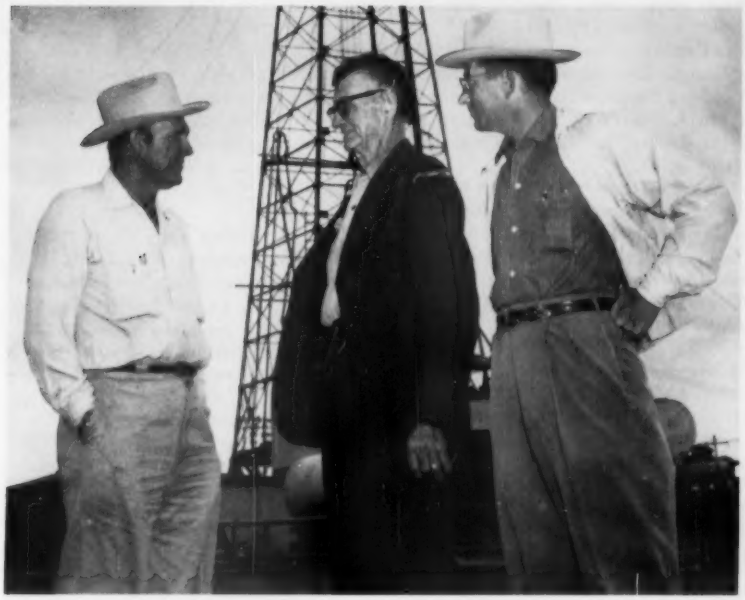
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

▶▶▶ Among the Drilling Contractors



Another discovery well . . . is credited to C. B. Webster Drilling Co., Houston, contractor on Trunkline Gas Co.'s and Cyprus Oil Co.'s newly completed deep wildcat producer 5 miles northeast of Abbeville, in northeastern Vermilion Parish, Louisiana Gulf Coast. At the well, Dallas J. LeBlanc (left in picture), Webster's tool pusher, discusses the completion with Ed V. Bond (right), Trunkline's production superintendent, and Joseph Stansbury, the well's landowner. The well, drilled to 15,200 ft., is completed in a 14,450-ft. sand flowing 4,266 M.c.f. of gas and 272 bbl. of condensate per day through 3/16-in. choke with pressure of 9,830 psi. It opens Grosse Isle field.

Barnwell keeps drilling rigs busy in southwest tristate area

EIGHT BARNWELL RIGS are being kept busy on contract or company operations in Arkansas, Louisiana, and Texas. An additional company operation in Mississippi is contracted out to Dorris Ballew, Inc., of Natchez, Miss.

Barnwell Drilling Co., Inc., operates seven of the eight rigs. Its sister company, Barnwell Offshore, Inc., owns the other. The latter, on its mobile offshore drilling platform, "Mister Cap," is drilling for Sinclair Oil & Gas Co. in the Ship Shoal Block 153 area, in the Gulf of Mexico, nearly 40 miles off the coast of Terrebonne Parish, Louisiana. Current operation is a 14,000-ft. test.

Four of Barnwell Drilling Co.'s seven active rigs are in Blocker field, Harrison County, East Texas, where they are engaged in 7,000-ft. field-development operations for the company's own account. In North Louisiana, Barnwell is drilling a deep Cotton Valley exploratory test in the old shallow Pine Island area, Caddo Parish, and a 7,000-ft. wildcat in Caldwell Parish. The other Barnwell rig, in Arkansas, is on a 7,000-ft. well in Fort Lynn field, Miller County.

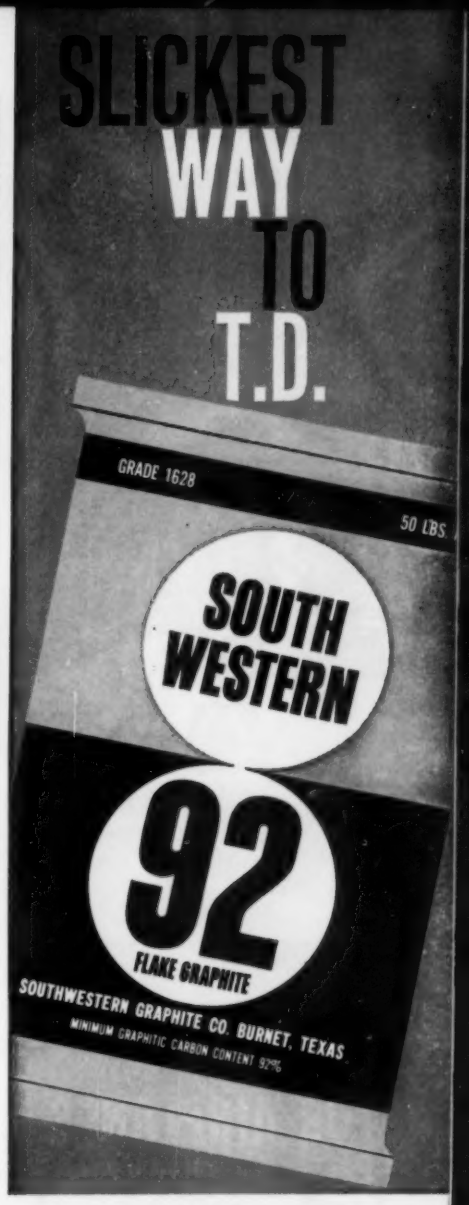
The two Barnwell companies headquarter in Shreveport. Heading the offshore drilling company is R. S. Barnwell, Sr., as board chairman, with Robert S., Jr., as president; F. H. Harrell, vice president; and B. J. Robbins, vice president and Gulf Coast general manager, located at New Orleans. L. B. Manley is executive vice president of Barnwell Drilling Co.

Barnwell's Mississippi operation, contracted to Dorris Ballew, is an 11,000-ft. test on the Pike County south flank of the Little Creek field.

Coastal slates three Alaska rigs

COASTAL DRILLING CO. soon will have three large rotary rigs running on contract in Alaska. Its third rig, which has been drilling in Wheeler Ridge field, Kern County, California, now is on its way to the 49th state.

Shipped by freighter from Long



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Beach, Calif., the rig will be unloaded at Seward, a deep-water, year-around port. From there it will be trucked to Kenai Peninsula.

Its first assignment is for King Oil, Inc., on acreage adjoining the already productive Swanson River Unit, where one of Coastal's other two Alaskan rigs is drilling for Standard Oil Co. of California.

Coastal assembled the rig, an Emsco GB800, last summer in its Bakersfield yard. A newly completed well at Wheeler Ridge was its first operation. The rig drilling for Standard on the Swanson River Unit is an Emsco A800 assembly.

Coastal's other Alaskan rig, a Wilson Super Titan assembly, is in the Iniskin Bay area, where it is drilling for Alaska Consolidated Oil Co.

First King Oil location for the new rig is less than 4 miles from the Swanson River Unit discovery well, drilled for Richfield Oil Co. Standard, now developing the unit, has just completed the Unit's second producer.

Who's getting the drilling contracts

Allen & Morris, San Antonio, are drilling a 9,500-ft. test for Lone Star Producing Co. at a wildcat location 3 miles southwest of Normanna, in Bee County, Central Texas coastal area. Its location is at 1 Harrell, in the Jose Maria Uranga Grant.

Field Drilling Co., San Antonio, is drilling on a newly started Wilcox wildcat in Live Oak County, South Texas. It is a contract job for Blanco Oil Co. and others at 1 Umphres in the W. Hodges Survey. Location is 2½ miles northwest of George West. Contract calls for 8,200-ft. drilling.

Montgomery Drilling Co., El Dorado, Ark., is on a new contract operation southeast of Fryeburg, in Bienville Parish, North Louisiana. It is drilling for Don D. Montgomery and associates, who plan a test to 7,300 ft. or 200 ft. into the Travis Peak. Location is on the operators' Davis lease in 6-16n-8w.

Delta Drilling Co., Tyler, Tex., has the contract on a deep test Charles H. Wacker, of Houston, is starting in northern Ascension Parish, southeastern Louisiana. Its location, at 1 Akridge, in 32-8s-3e, is 4 miles east of Prairieville, and nearly 6 miles from nearest production. A 12,000-ft. test is planned.

Vasser & Brown, Natchez, Miss., contractors, are starting a confirmation test for the newly completed discovery well they drilled for E. Saunders Alpaugh, of New Orleans, a mile south of Fordoche field, in southern Pointe Coupee field, South Louisiana. The discovery well is productive of high-gravity oil from a 7,575-ft. sand drilling to 7,646 ft. The new operation is at 1 Louisiana Bank and Summers. The area is 6 miles south of Lottie.

H & S Drilling Co., Tulsa, contracting for Kinsey & Kinsey, of Shreveport, is starting a confirmation test for W. C. Feazel Interest's newly completed Smackover discovery well at Rocky Mount, in Bossier Parish, northwestern Louisiana. Its location, at 1 Curry, in 28-22n-12w, is about a mile north of the discovery well. The latter well was drilled to 11,927 ft. It is productive from a series of perforated intervals from 11,598 to 11,708 ft. Production is gas and condensate.

Jimmie Owen, Layafette, La., is contractor on a wildcat W. W. F. Oil Co., Ray Oil Co., and Nemours Corp. are putting down southeast of Lebeau, in St. Landry Parish, South Louisiana. It is an 8,900-ft. test at 1 Mose Montrilh heirs, in 9-4s-5e. Location is 4 miles northeast of Washington field, nearest production.

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▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .

Twin-engine helicopter hauls five

. . . including the pilot plus 160 lb. of baggage or a maximum cargo load of about ½ ton. It is powered by two air-cooled, 225-hp. engines. Each engine is equipped with a turbosupercharger.

The helicopter is expected to prove particularly useful to oil and gas-pipeline companies for inspection of pipelines and to drillers for hauling cargo to drilling sites.

Fuel consumption of the two engines is about 28 gal. an hour, a particularly valuable feature where fuel must be shipped in over long distances.

Construction features include a first-stage reduction mechanism employing a bank of wedge type of drive belts on each engine that simplifies engine change and acts as a torsional-vibration shock absorber.

Cargo mounts in the BS-12 helicopter in a well directly below the engines and the four-bladed rotor. It is thus protected from the air stream and firmly mounted against swaying motion.

High-speed rating of the helicopter is 85 m.p.h. at sea level. Rated cruising speed is 75 m.p.h. Range is 175 miles. Maximum rate of climb at sea level is 950 ft. a minute. Fuel capacity is 80 gal. **Write or call: Omega Aircraft Corp., New Bedford, Mass, for details on BS-12 helicopter.**

●

Circuit breaker puts radio on air

. . . instantly when main cable fuses fail. The circuit breaker uses a push-button reset feature to put mobile radio systems back on the air. It is expected to prove highly valuable for two-way radio units installed on vehicles as it eliminates the need for replacement of fuses on the main power lead from a vehicle's battery to the radio.

It thus gives immediate restoration of communications for vital emergency messages. A vehicle operator can merely push a button under the hood of the vehicle to get the radio back into operation, once he has cleared the fault causing the original short circuit.

The circuit breaker was designed for use with GE radio equipment. But it may be installed on other types with minor modifications of the mounting bracket. **Write or call: General Electric Co., Communication Products Dept., Electronics Park, Syracuse, N. Y., for details on circuit breaker for mobile radios.**

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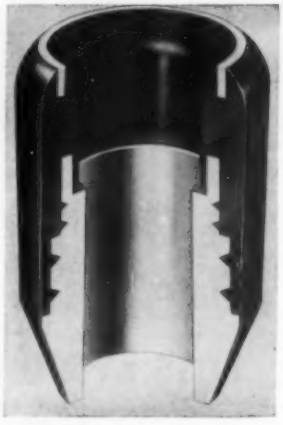


Interchangeable cup-swab mandrel

. . . designed to reduce parts inventories. The Mark 1 cup swab mandrel is interchangeable with the maker's E Z swab, allowing greater flexibility in running swabs. Changeover is fast and simple.

The positive-displacement type of swab has a steel core. It is built to handle fluid loads of 1,200 ft. and heavier.

No metal is in contact with the tubing wall at any time, thus damage is prevented to coated tubing. A large fluid passage in the mandrel allows fast descent of the swab. Mandrels for 2, 2½, and 3-in. swabs are equipped with a ¾-in. API sucker-rod pin-top connection. The pin thread has a 1⅛-in. diameter and 10 threads an inch. **Write or call: Mission Mfg. Co., P. O. Box 4209, Houston, for details on Mark 1 cup swab.**

Send this Showcase Coupon

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

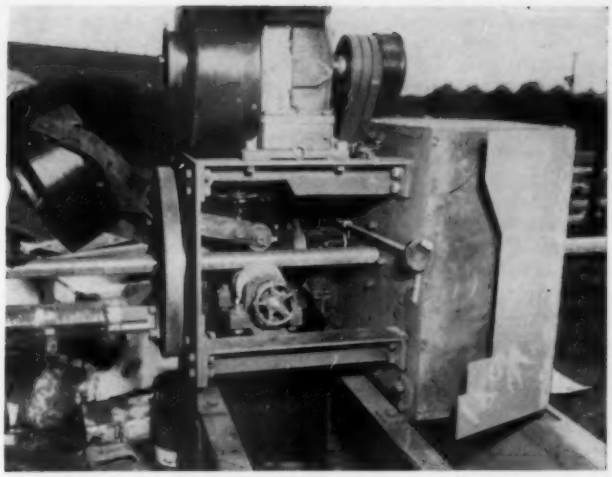
Described in **OIL AND GAS JOURNAL** · Issue of Jan. 12, 1959

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....



Power driven . . .

. . . and mounted on a trailer . . .

Specially-designed machine cleans, primes, tapes

. . . and wraps 2-in. pipe. Designed for small distribution pipe, the new Model E-7 taping machine automatically performs the four operations on more than 2,500 ft. of pipe an hour. It is expected to prove valuable for in-the-yard taping with vinyl tape as it permits taping pipe as needed rather than having capital tied up in mill-coated pipe.

A 9-hp. engine powers the machine as it first wire-brushes the pipe, applies the primer, wraps the vinyl tape, and overwraps the pipe for mechanical protection.

Pipe is fed into the machine through the cleaning head. The two wire brushes rotate at 4,000 r.p.m.

Lap width can be adjusted while the machine operates by increasing the speed of the pipe as it passes through the wrapping heads. Both taping heads are self-adjusting in angle for all sizes of pipe from ¾ to 2 in. Adjustments for pipe size and tension on the cleaning brushes are made with the machine stopped. **Write or call: Minnesota Mining & Mfg. Co., 900 Bush Street, St. Paul 6, for details on Model E-7 taping machine.**

Treating packer is versatile

. . . as it can provide an effective method for treating, water-flooding, or producing use. Short, compact, and retrievable, the packer is full-opening and designed to be run on tubing into a cased hole to isolate a section to be treated or produced in oil, gas, or water-injection wells.

The R-3 packer is built to take up to a 5,000-psi. working-pressure differential and may be run repeatedly. It consists of a packer rubber, drag springs, and mechanical slips mounted in a sleeve, plus a J-slot locking arrangement.

A full-opening mandrel permits passage through the tool of any equipment that will normally pass through the tubing. The packer is designed to run primarily as a tension packer. It is set by turning to the right and applying an upward pull on the tubing. Tubing holddown is not needed as the packer is self-anchoring against the casing wall to provide a seal. **Write or call: Halliburton Oil Well Cementing Co., Duncan, Okla., for details on R-3 treating packer.**

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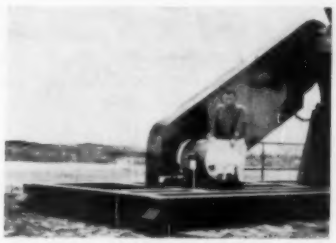

Oil-well-pump motor size extended

. . . to 75 hp. New sizes of the Green Triangle motor are 40, 50, and 75 hp. Previously the motor came in a range of sizes from 3 to 30 hp. The larger motor sizes include the same features as the smaller ones—double shaft extensions, high slip and starting torque, and a guaranteed service factor. Operating speed is 1,200 r.p.m. (synchronous).

The double shaft extensions allow a pumping unit to be driven from one and auxiliary equipment from the other. A cover protects the shaft not used.

Also available is a motor with a 900-r.p.m. operating speed for pumping with single-reduction-gear pumping units and wells needing a slower pumping speed. The slower-speed motor comes in sizes of 3 through 20 hp. **Write or call: Continental-Emsco Co., 608 Continental Building, Dallas 1, for details on Green Triangle motors.**

●

Recorder gives variety of well data

. . . as it will record and print well identification, date time, and accumulated test data. The GOT-

Simplex recorder is designed to record complete and comprehensive automatic well test and production information. According to the maker, it eliminates many of the costly data-storing devices found in some instruments.

Used with an electric well-test programer, it prints automatically the data at the beginning and end of a test, including accumulated totals of the data channels. Printing can be obtained on demand during a well test by operating a manual print push-button switch on the recorder.

The basic recorder has a capacity of 40 well-identification characters and four data channels. Test data is printed on a paper roll 10¾ in. wide. A dust-tight case houses the recorder. Controls are easily reached on the front of the housing. **Write or call: Garrett Oil Tools, Inc., P. O. Box 2427, Longview, Texas., for details on GOT-Simplex recorder.**

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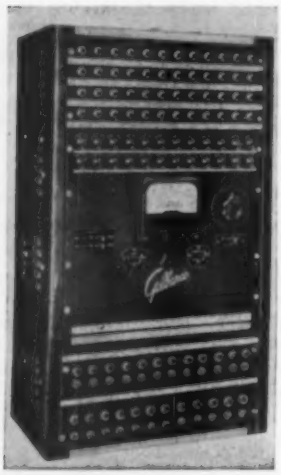

Electronic tank gage does two jobs

. . . using the same basic components. It measures both water interface and product level. The Gilbarco gage measures by a sensing element suspended in the tank. The element is a quarter-length antenna which just touches the product surface.

Radio frequency signals of minute amplitude are transmitted to the antenna. Against a fixed or constant signal are balanced detected or variable signals. Rise or fall product level results in an immediate signal unbalance. This causes the sensing element to move either up or down following the product level as the mechanism constantly strives to maintain exact balance between the fixed and detected signals. Gage accuracy is ± ⅛ in.

The same sensing element for the gage is used to measure bottom water by operating a switch on a servo-control mechanism at the base of the tank. When the switch is turned on, the sensing element moves below product level and continues sounding through the product until it reaches the surface of the water. Readings of water level are recorded on the dial that indicates product height. They can be taken remotely through the use of an optional auxiliary cabinet.

Conversion kits are available to change installed Gilbarco gages to dual operation. **Write or call. Gilbert & Barker Mfg. Co., West Springfield, Mass., for details on dual-purpose tank gage.**

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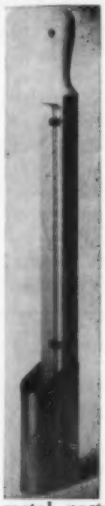
Thermometer graduations are etched



. . . in glass and filled with special pigment. The graduations on the Everlast API type of tank thermometer are then fused into the glass so they will not fade, peel, or dissolve.

The thermometer is accurate to within one scale division. When viewed through the lens type of scale, the mercury column appears red. The case is made from select hardwood. Accurately made and finished smooth, it resists warping and cracking. Friction clips hold tight but permit easy exchange of tubes. All metal parts of the thermometer are nonsparking.

The thermometer meets the provisions of API Standard 2500 and ASTM Specification E-1. **Write or call: W. H. Curtin & Co., 4220 Jefferson, Houston, for details on API tank thermometer.**

•

Trailer-mounted metering separator

. . . for crude oil is mounted on special sand tires for use in the desert. The Hi-Cap unit automatically separates oil, gas, and water produced at the wellhead and measures each component. Capacity is 5,000 bbl. a day of viscous, gas-entrained crude oil.

Special missing controls measure the liquids by weight as they flow through the unit. Similar type of units are available to handle up to 50,000 bbl. a day of crude oil. **Write or call: Rolo Mfg. Co., P. O. Box 6763, Houston 5, for details on Hi-Cap metering separator.**

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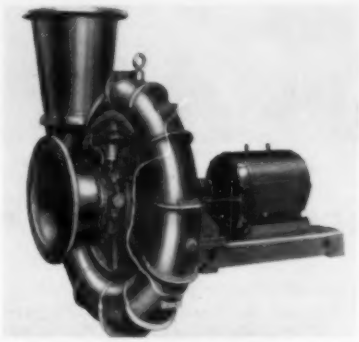


Single-stage centrifugal compressor

. . . comes in two types for refinery and petrochemical plant use. The Type OM unit provides air service at low discharge pressures. The Type OPB Series handles gas and air applications at higher discharge pressures.

Sizes are available for the range from 1,200 to 80,000 c.f.m. with input ratings from 10 to 2,500 b.hp. Discharge pressures up to 900 psig. can be handled in the lower-capacity models.

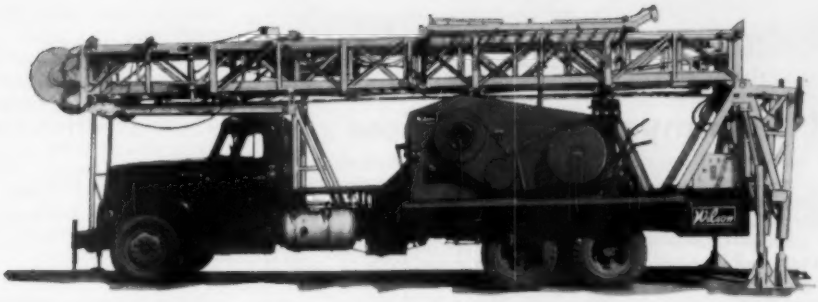
The compressor is essentially a constant-pressure, variable-volume machine. Applications include blower service where inlet conditions are atmospheric, exhauster service where inlet conditions are below atmospheric or booster service where inlet conditions are above atmospheric pressure. **Write or call: Clark Bros. Co., One of the Dresser Industries, Olean, N. Y., for Bulletin 165.**

•

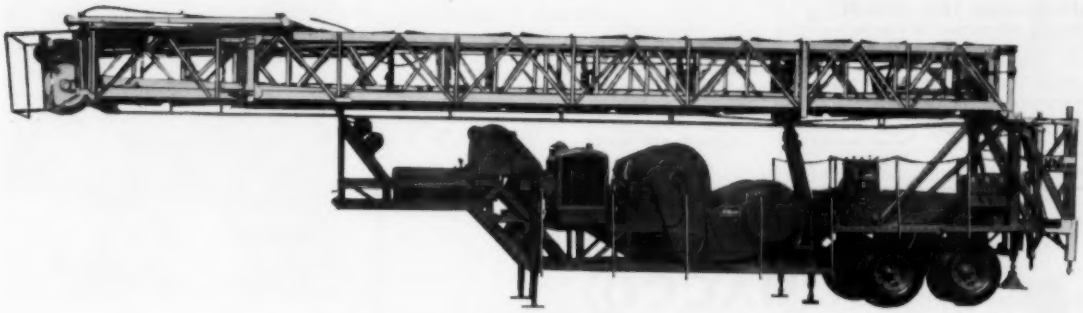
Twin-engine executive plane

. . . has fuel-injection engines and cruises at 220 m.p.h. The 1959 Model 310C Cessna plane is powered by two 260-hp. engines that give it a

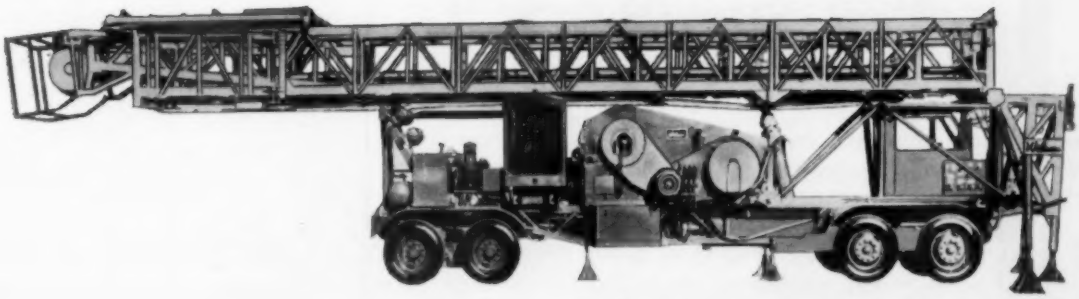
for the FASTEST, SMOOTHEST well servicing which WILSON winch do you want ?



TRUCK-POWER TAKEOFF OR ENGINE DRIVE



TRAILER



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There is a Wilson Winch for any depth and any terrain—Let RED IRON eliminate RED INK for you!

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ACCO BOOMER CHAINS

Ideal for many oil field services

• You will find many uses for ACCO Boomer Chains—the strong, rugged chains specially designed for such applications as booming loads, winching and towing. ACCO Boomer Chains are made from High Test steel or Accoloy steel in 20-foot lengths.

You need these fine ACCO products, too...

WEED TRUCK CHAINS
—engineered for oil field use

WINCH LINE TAIL CHAINS
—flexible end-member for wire rope

Each Boomer Chain has an alloy drop-forged Grab Hook (I-beam type) on each end, attached at the factory and proof tested.

Boomer Chains of High Test are available in six sizes, from ¼" x 20 ft. through ⅝" x 20 ft....packed one to a blue bag. Chains of Accoloy are made in four sizes, from ⅜" x 20 ft. through ⅝" x 20 ft....packed one to an orange bag.

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For a number of years MACCO has normalized all gas lift mandrels. These mandrels are heated to 1200-1400 degrees temperature for 4 hours. This stress-relieving process reduces concentrated corrosion and electrolysis to a minimum, thereby prolonging the useful life of the mandrel. NO EXTRA CHARGE is made for this service.

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top speed of 242 m.p.h. Rate of climb is 1,800 ft. a minute. Gross weight is 4,830 lb. Maximum range at 10,000 ft. is 1,110 miles with 100 gal. of fuel and no reserve. Service ceiling is 21,300 ft. Useful load, including fuel and oil, without auxiliary tanks is 1,810 lb.

Features of the new plane include optional individual reclining rear seats or individual chair combinations for five persons. A new folding desk may be attached to the rear of either front seat.

The instrument panel has the electronic equipment centralized for convenience. Other equipment includes 25-amp. generators, dual-fuel pressure gage, air-induction system heater, and two engine-driven fuel pumps and vacuum pumps. **Write or call: Cessna Aircraft Co., Wichita, Kan., for details on Model 310C plane.**

•

Telemeter for long-distance

. . . transmission and control of process data monitored at scattered locations comes in two types. One is a miniaturized system that uses transistors instead of vacuum tubes. It measures such process variables as temperature, pressure, liquid level, flow, and others that can be converted into an electric signal. It transmits the data as frequencies over any communications channel to a control center.

The other system is a pulse type. It also transmits process data as electric signals. These signals are at 5 or 10-second intervals instead of instantaneously. The signals are transmitted at distances up to 100 miles from the source without repeater relays.

The pulse type of telemetering system consists of a recorder or indicator at the point of measurement, a power pack for transmission of the signal, and a receiver at the receiving location. **Write or call: Minneapolis-Honeywell Regulator Co., Brown Instruments Div., Wayne & Windrim Avenues, Philadelphia 44, for details on telemetering systems.**

SHOWCASE . . .

New Literature

Wheel-mounted backhoe-loader

. . . rated at 42 hp., is described in new eight-page Bulletin CUS-110. It presents 35 operating advantages of the "matched" trenching-loading machine, plus pertinent mechanical details of the backhoe, loader, and heavy-duty tractor. The bulletin includes action views of the machine working under various conditions. **Write or call: J. I. Case Co., 702 State Street, Racine, Wis., for Bulletin CUS-110.**

64-page revised chemicals

. . . catalog is now available. It's divided into separate sections devoted to surfactants, organic intermediates, acetylene derivatives, carbonyl-iron powders, ethylene oxide, and glycols. The catalog contains numerous specialty chemicals, including optical brighteners and ultraviolet light absorbers. Product composition and properties are given. **Write or call: Antara Chemicals, 435 Hudson Street, New York City 14, for Chemicals catalog.**

Power-transmission bulletin

. . . describes variable-pitch sheaves, V-belts, flat-belt pulleys, pillow blocks, flange units, takeup bearings, couplings, and timing-belt drives in eight pages. It includes a postcard to aid in securing additional literature on items pictured or described in the bulletin. **Write or call: T. B. Wood's Sons Co., Chambersburg, Pa., for Bulletin 3101.**

190-page wire-rope catalog

. . . is fingertip-indexed for your speed and convenience. The catalog discusses peening, rated capacities, metallic core, cable-laid rope, inspection, correct spooling, constructions, sheave maintenance, multiple-rope reevings, swaged fittings, uses and abuses of wire rope, etc. **Write or call: Macwhyte Wire Rope Co., 2940 Fourteenth Avenue, Kenosha, Wis., for Wire-Rope Blue Book G-16.**

Centralized control systems

. . . are outlined in new 16-page Bulletin 106. It gives the design approach, materials, construction, and modern facilities used in manufacturing a variety of control and data-presentation systems. **Write or call: Panellit, Inc., 7401 North Hamlin Avenue, Skokie, Ill., for Bulletin 106.**

Weed and brush controls

. . . along pipelines and other rights-of-way are reviewed in a new four-page pamphlet now accessible. It tells how to simplify, speed up, and economize on vegetation-control problems. **Write or call: Diamond Alkali Co., 300 Union Commerce Building, Cleveland 14, for Weed and Brush-Control pamphlet.**

Determine owning, operating costs

. . . of construction equipment with the help of a 24-page monthly time and cost record book. It contains pages on which to record, day by day, each month's individual machine expenses for an entire year. At the end of the record section is an annual summary sheet where the totals for each month can be entered to obtain annual-cost figures. The record book provides spaces for recording both the quantity and cost of oil, grease, etc., plus operator's time. There is also space for the type and amount of miscellaneous costs, and columns labeled repairs, machine-hours worked, and type of work. A back section explains simple methods of calculation to help compute costs. A pocket-size daily time and cost record booklet is also available to help you record expenses as they occur in the field. Periodically, these figures may be transferred from the daily to the monthly cost record book. **Write or call: Caterpillar Tractor Co., Advertising Division, 600 West Washington Street, East Peoria 8, Ill., for Monthly Time and Cost record book (Form 33216), and Daily Time and Cost record booklet (Form 32818-G).**

Measuring, control equipment

. . . is detailed in four new bulletins. Bulletin 400 describes pressure recorders and elements. Recording charts and planimeters are described in Bulletin 407. Bulletin 408 covers temperature recorders and elements, and Bulletin 409 outlines details on recording orifice meters with temperature-recording element. **Write or call: American Meter Co., Advertising Dept., 920 Payne Avenue, Erie, Pa., for Bulletins 400, 407, 408, and 409.**

Diaphragm valves

. . . for every type of pipe is the topic of a new six-page folder now available. The folder contains many items that might be considered when selecting valves for process-piping systems. It includes advantages of diaphragm valves and their ability to meet pipe specifications and shows typical process applications. **Write or call: Hills-McCanna Co., 4606 West Touhy Avenue, Chicago 46, for Bulletin 115.**

Valves, multiple-completion

. . . and wellhead equipment are detailed in a new 56-page catalog. It contains tables and graphs for handy information and includes a convenient index. The catalog also lists information on miscellaneous equipment such as API flanges, ring gaskets, studs, nuts, etc. **Write or call: McEvoy Co., P. O. Box 3127, Houston 1, for Valves, Multiple-Completion, and Wellhead Equipment catalog.**

DISTANCE MEASURING IS FAST,

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When towed from the rear of your vehicle, the Rolatape 600 is ideal for measuring leasehold improvements, pipe laying, exploration and many other needs. Can also be used by hand.

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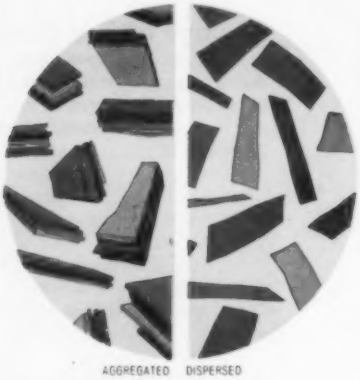
controls flow properties *in drilling mud*

RESISTS ANHYDRITE CONTAMINATION

OVERCOMES EFFECTS OF SALT WATER



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Q-BROXIN'S effectiveness in reducing viscosity and gels in salt, gyp or fresh water mud is unique among mud thinners. This unique property has led to widespread use of **Q-BROXIN** for compounding aggregated muds with a filtrate that inhibits the swelling of clays and shales. In these and other types of mud **Q-BROXIN** has a surprising capacity to reduce filtration. You can hold down mud drilling costs when you specify **Q-BROXIN** —*and* Baroid know-how.

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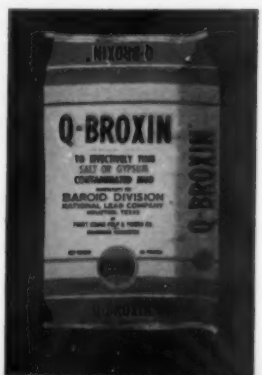


* Registered Trademark, Puget Sound Pulp & Timber Co.

B 5810

Sidney A. Lewis is appointed

. . . manager of Walworth Co.'s technical-sales service. He will also be manager of bronze-valve sales.

Lewis joined Walworth in 1955 as manager of plastic-division sales where he supervised the engineering and sales of valves and fittings. Before coming to Walworth, Lewis was assistant sales manager of U. S. Stoneware Co.

Hugh Q. Buck is named

. . . acting president of Houston Oil Field Material Co., Inc., following the death of George O'Leary, founder and president of HOMCO.

Buck, a partner in a Houston law firm, will continue in this capacity while serving as HOMCO's president until a new one is appointed. Buck has been general counsel for the company for 17 years.

Happy Co. is named an agent

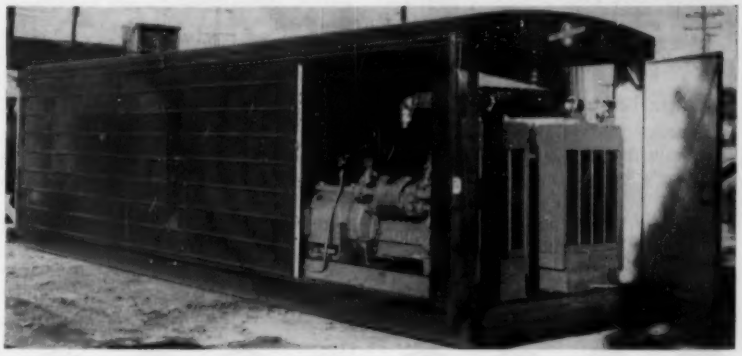
. . . for Flow Equipment Co., Inc.'s Floco products throughout the Mid-Continent area. At the same time, Happy was appointed a dealer for Kohler Co.'s portable electric-generating plants throughout Happy's area of coverage.

Meanwhile, Happy Co. board of directors announced the election of Leo C. King, veteran of 34 years in sales and service, as board chairman. Paul E. Mahaffey, who served as president from 1920 to 1952, and chairman since 1952, will be retained as a director and administrative adviser to the board.

Succeeding King as sales manager will be W. C. McDonald of Tulsa, former district manager for Boston Woven Hose & Rubber Co. of Cambridge, Mass.

Eugene H. Nelson appointed

. . . a district representative for Koehring Division of Koehring Co., reports J. E. Chadwick, vice president of the division's sales and service. Nelson was formerly a district representative for the company's Parsons Division at Newton, Iowa. Nelson will represent Louisiana, Texas, Oklahoma, and New Mexico, and will headquarter in Dallas.



Portable power plants designed and made by Stewart & Stevenson Services, Inc., will provide electric power for lighting and general-purpose use at the overseas camp sites of drilling rigs known as The Seacat of Turkey and The Seacat of Somaliland. The S&S utility units are complete with power plant, machine shop or field-office compartment, and a 75-kv. Model 6-GD 75 S&S diesel a.c. generator set.

Bradford Supply Co. moves

. . . its general sales offices to Tulsa and names F. E. Foster and Carl H. Peterson as general sales manager and administrative assistant, respectively, of the new headquarters.

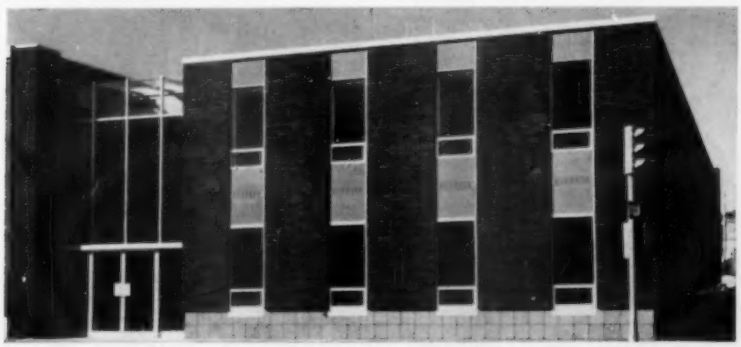
F. E. Foster

C. H. Peterson

At the same time, Glenn Curry, a 20-year veteran of Mid-Continent oilfield supply sales, was named sales representative in the Oklahoma area. Curry will headquarter in Tulsa.

The move was the first step aimed towards expanding Bradford's service in the Mid-Continent, Southwestern, and Rocky Mountain regions, according to D. W. Mackie, Jr., president. The company's administrative headquarters will remain in Bradford, Pa.

Glenn Curry



Modernistic two-story structure houses new home offices

. . . of Mountain Iron & Supply Co. The new Misco building is located in Wichita, Kans., three blocks south of Mountain's former location. The new structure more than doubles the office space formerly occupied by the company. Mountain Iron uses all second-floor space and part of the first floor. S. O. (Bud) Beren, president of Mountain Iron, offered this comment: "The Misco building represents our vote of confidence in the future of the oil and gas industry."

PESA committee to sponsor

. . . a sales-training course in petroleum equipment, supply, and service industries. The course will be held at the University of Oklahoma at Norman. The first session is slated from

January 19 to 23. Inquiries about this, and subsequent courses, should be directed to M. L. Powers, Director, Business and Industrial Services, Extension Division, University of Oklahoma, Norman, Okla.

E. H. (Ed) Murphy appointed

. . . special representative to the pipeline industry by Gardner-Denver Co. Murphy's headquarters will be in Dallas, but his activities will be coordinated from the firm's headquarters in Quincy, Ill. He will work with contractors wherever pipelines are laid.

Murphy joined Gardner-Denver more than 30 years ago. Last year he was in charge of a special subbranch at Fort Williams, Ontario, Canada, during construction of the Trans-Canada pipeline.

J. T. Petersen is appointed

. . . manager of petroleum and chemical sales in the New York district, announces Allis-Chalmers Industries Group. Petersen, who had been manager of metals industry sales at Cleveland since 1957, joined Allis-Chalmers 10 years ago. He had been a sales representative in the Cleveland district since 1951.

ROCKFORD

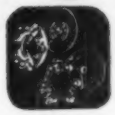
Eliminates the Pilot Bearing in this

OIL FIELD TYPE

Heavy-Duty

LONG LIFE

POWER TAKE-OFF



Small Spring Loaded

Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

Eighty five percent of all take-off failures that are caused by misalignment, lack of lubrication, overload and other reasons—stem from the pilot bearing. By eliminating the pilot bearing—in this new Oil Field type, long-life, extra heavy-duty power take-off—ROCKFORD has reduced down-time to a minimum. This improvement will help increase the trouble-free work-hours of your equipment.

BW SEND FOR THIS HANDY BULLETIN

Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

ROCKFORD Clutch Division BORG-WARNER

1305 Eighteenth Ave., Rockford, Ill., U.S.A.

Export Sales: Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES

William C. Franklin is appointed

. . . assistant sales manager of Texas Butadiene & Chemical Corp., Houston. Franklin had been with C. F. Braun & Co. 3 years and with Union Carbide Chemicals Co. 8 years. He joined TB&C in 1957.

Francis W. Winn joins

. . . Fritz W. Glitsch & Sons, Inc., Dallas, as director of research and development for fractionation trays. He formerly was technical director of Fractionation Research, Inc., Alhambra, Calif. Winn also had been associated with Pan-American Petroleum Corp., Socony-Mobil Oil Co., and Catalytic Construction.

Porter adds new division

Thermoid Division of H. K. Porter Co. (Delaware) has been formed as a result of action taken by boards and stockholders of Thermoid Co. and H. K. Porter Co., Inc. The new division will manufacture and market all products formerly made by Thermoid Co. and Porter's Quaker Rubber Division.

James A. Green is named

. . . sales representative in Oklahoma and Kansas for Tubular Lining Corp. He will headquarter in Tulsa. Green was formerly a sales engineer with Lee C. Moore Co.

B. H. Pickard elected president

. . . of Tuboscope Co. International, a subsidiary of Tuboscope Co. of Houston. Pickard's election is a result of an expansion program by which the company plans to meet the demands of more than 280 drilling contractors and oil companies now drilling for, or producing, oil in Europe, North Africa, the Middle East, and South America. Pickard has been with Tuboscope for 17 years.

In addition to Tuboscope's present overseas activities in Arabia and Iran, bases of operation are being planned in western Europe, South America, and the Far East to service the expanding foreign oil industry.

Robert Spellman promoted

. . . to vice president in charge of West Texas, including Dallas and Fort Worth, with headquarters in Midland, Tex., of Franklin Supply Co. He formerly was district manager of the Midland area. He was also appointed a new director. Clarence Sublett, vice president in charge of the Midwest area, was appointed to the board, along with William Carroll, vice president of the eastern seaboard and export division.

V. C. Horner is advanced

V. C. Horner

. . . to vice president and general manager of BJ Electronics, reports Andrew W. Rose, president of the Byron Jackson Division of Borg-Warner Corp. Horner was vice president and sales manager of Byron Jackson Tools, Inc.

Horner has been with Byron Jackson 18 years. After 7 years in oil-tool engineering he became assistant chief engineer operating in the Mid-Continent region. In 1951 he assumed general managership of the company's Dempsey Pump Division in Tulsa.

He returned to Los Angeles to become assistant general manager of Byron Jackson Tools, Inc., in 1955 and subsequently was named vice president and sales manager.

Ray V. Long is promoted

. . . from district sales manager to vice president and sales manager of Vapor Recovery Systems Co. Long was representing the company on special assignments involving sales and service problems before his promotion.

Vinson Supply Co. to construct

. . . new warehouse facilities in Dallas and Houston, according to Bailie W. Vinson, president.

The move is necessitated by the acquisition of Vinson Steel & Aluminum Co. by Joseph T. Ryerson & Son, Inc., a subsidiary of Inland Steel Co., Vinson said. Vinson Steel & Aluminum, once a part of Vinson Supply, was created a separate company five years ago in Dallas, with subsequent expansion to Houston in 1956.

In Houston Vinson Supply is retaining one-half the land adjoining the Steel & Aluminum facilities, and will build about 70,000 sq. ft. of warehouse space and 10,000 sq. ft. of offices.

Garrett names distributors

. . . to handle the sale of company products in three areas.

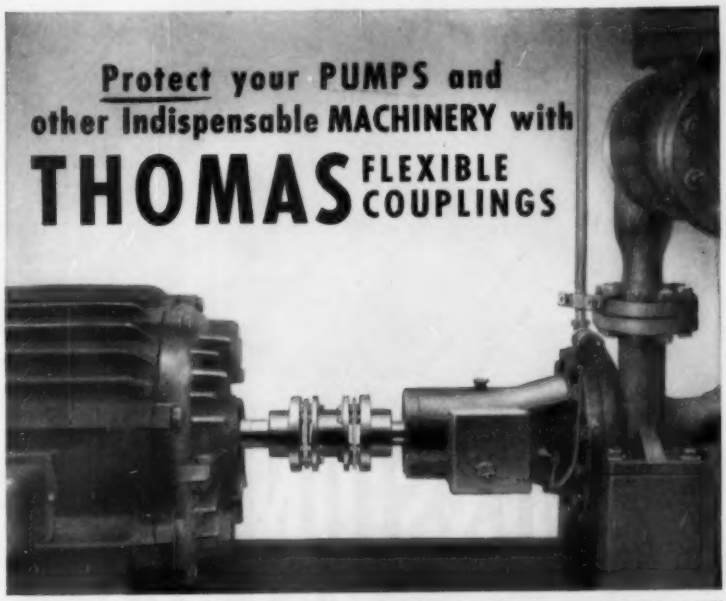
Tri-State Industrial Supply Co., with offices in Farmington, N. M., will handle all Garrett Oil Tool, Inc.'s, products in the Four Corners area.

Posey, Inc., of Casper, Wyo., is the new distributor for all products except relief valves in Wyoming, North and South Dakota, Montana, and Nebraska, and in the portions of Colorado and Utah outside the Four Corners area.

Frank White Co., of Shreveport, La., will handle all products except relief valves in northern Louisiana, Arkansas, and in the shallow and deep Waskom fields in East Texas.

R. L. (Bob) Gammill joins

. . . Sperry Western, Inc., as sales representative for Southeast Louisiana. He will headquarter in New Orleans. Gammill was formerly with Dowell, Inc., Lafayette, La.; Oil Center Tool Co., Houston; and Continental Oil Co., New Orleans.



NO LUBRICATION NO MAINTENANCE NO WEARING PARTS

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.
They will protect your equipment and extend the life of your machines.
Properly installed and operated within rated conditions, Thomas Flexible Couplings should last a lifetime.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES:

- Freedom from Backlash
- Torsional Rigidity
- Free End Float
- Smooth Continuous Drive with Constant Rotational Velocity
- Visual Inspection While in Operation
- Original Balance for Life
- No Lubrication
- No Wearing Parts
- No Maintenance

Write for Engineering Catalog 51A

THOMAS FLEXIBLE COUPLING COMPANY
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HERE'S

automatic (LOW COST) sealing for you

MISSION VALVES

Here's a valve that thinks for itself. A valve that is always working for you without costly maintenance, without constantly losing pressure. The Mission Valve is always ready to seal. And what's more, the higher the pressure, the tighter the seal.

Why? Because line pressure forces Mission Sealant through two small circular grooves around the downstream port, sealing like a plastic packing, or forms a gas-tight seal. Leaks are stopped automatically before they start.

The two spherical cores, acting like a pressure wedge proof, allow easy opening and closing even under pressure. The complete line of 315 Mission Valves brings the positive advantages of easy opening and tight sealing to practically all valve applications. This wide selection, the Mission Guarantee, and the Mission Renewal Policy combine to make Mission Valves your best buy. Specify Mission and eliminate your valve problems.

Nothing but the finest will bear the name of MISSION MANUFACTURING CO.

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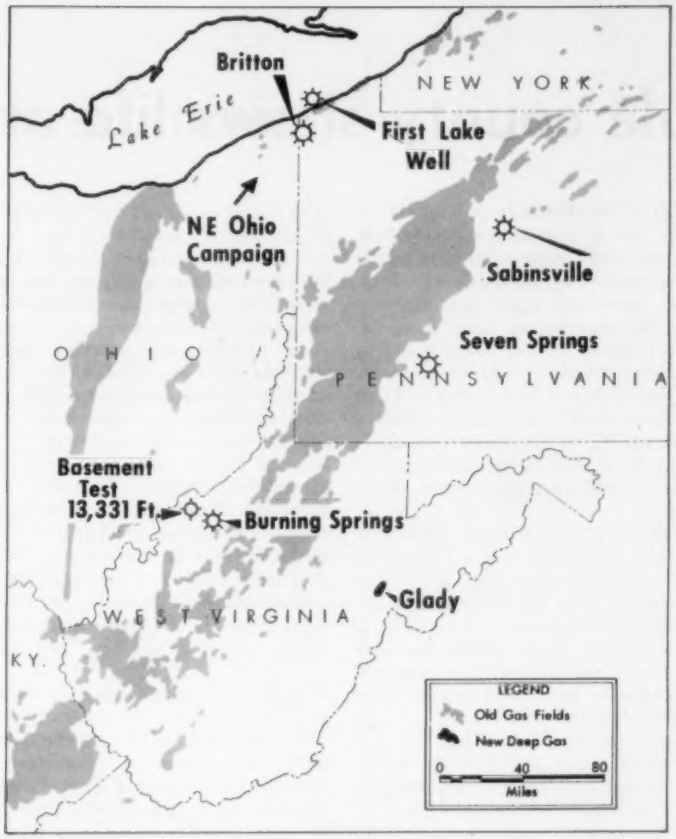


DEEP DRILLING in the Appalachian province, plus new theaters of interest, accent a growing industry for that region. New gas finds in Lake Erie, northeastern Ohio, and northwestern Pennsylvania, plus deep new strikes in Central Pennsylvania and West Virginia, are causing the industry to take a new look.

Oldest oil region rates a new look

BY FRANK J. GARDNER

OIL AND GAS EXPLORATION is now 100 years old. It all began in the Appalachian province, and strangely enough, we probably know less about the subsurface geology of that province today than any other. The reasons for this are many. Poor records were kept in the early days of the industry; there was little or no government supervision (or even interest) in drilling activity; and with the migration of drilling to the Southwest in the wake of big discoveries there, interest in the Appalachians died a slow death. As a result, there's far too little recorded dope on the much-drilled shallow formations, and the deep ones were never pierced.

Looking back . . . This situation presents a real challenge to the oil finder. Surely, when the wildcatters said goodbye to the Appalachians and flocked to the great Southwest, they left a lot of undiscovered oil and gas behind. It's up to the petroleum geologist now to find it.

And he's beginning. The few outfits who have really gone after the forgotten Paleozoics in the East are reporting good success. A three-pronged attack with surface geology, geophysics, and a heavy dose of subsurface study can seldom fail here.

Leads to overdue payoffs . . . Some of the most notable strikes of recent weeks are spotted on the map here. In West Virginia, Hope Natural Gas Co. recently finished its 10160 Leora Elliott, in Ritchie County on the Burning Springs anticline, for 5,290 M.c.f. of gas per day; flow was from the Silurian dolomite. Three sets of perforations between 6,930 and 6,968 ft. paid off after mud acid and gelled kerosine fracturing were applied. Hope had intended to carry this one to basement at about 13,500 ft., but the commercial gas in the Silurian sidetracked that plan and it was finished at total depth of 7,443 ft.

In 1956, Hope drilled its 9634 Power Oil Co. (see map) to 13,331 ft. in this area. It drilled 55 ft. of Precambrian gneiss and was abandoned, but at the time, it was referred to as "perhaps the most interesting test ever, or at least during the present century, drilled in the Appalachian province." Why? Because it was the **first** to be drilled through the entire sedimentary section to Precambrian.

Take a look at another West Virginia field: Glady, in Randolph County, was first found in late 1954 by Columbian Carbon Co. Since then, 21 gas wells and **no** dry holes have been finished. This field, on the Blackwater anticline, is now 13 miles long and 1 well wide, and the average potential is 7,586 M.c.f.d. Hope drilled 6 of these wells, and Columbian 15. Production comes from Oriskany-Devonian sand at 5,000-6,000 ft.

To the north, in Clearfield County, Pennsylvania, New York State Natural Gas has uncovered a strat trap in the Oriskany that is believed to be 90 miles long. Wells are deeper here (7,300 ft.), but with a little more deep drilling and some good subsurface head scratching, New York State expects to develop an excellent gas field along the flanks of the Sabinsville anticline.

A more recent Pennsylvanian discovery in Westmoreland County on the Seven Springs anticline. Peoples Natural Gas Co. 1 Blair flowed 3,663 M.c.f.d. from Onondaga - Devonian chert at 7,831 ft. total depth without fracture treatment.

In a delayed comeback . . . Couple this new deep-drilling complex with the exploration interest in entirely new places in the Appalachians, and you cannot escape the obvious conclusion that the province is definitely on the comeback.

Just turn this page and see!

An Ohio sleeper stirs . . .

Ashtabula county shows life after

BY EARL H. LINN
Staff Geologist, Benedum-Trees Oil Co., Pittsburgh, Pa.

A cable-tool campaign is paying off in Ohio, declares the author, a geologist who has practiced his profession in the West Texas, Tristate, Mid-Continent, and Rocky Mountain areas, as well as in southeastern and southwestern United States. Drilling costs vary from $3.75 to $4 per foot, and completion costs are comparable to other active areas, explains Linn, who is presently staff geologist with Benedum-Trees Oil Co., Pittsburgh.

A CONCENTRATED drilling play is going on in northeastern Ashtabula County, Ohio, after a 30-year period of sporadic exploratory work. Presently, there are eight rigs running, with the prospect of more to come. Both gas and oil are being found in the Lower Silurian Medina sandstones, ranging in depths from 3,000 to 3,600 ft. These sandstones have an average thickness of 40 ft., with probably 8 to 15 ft. of this being effective and with porosities ranging from 8 to 16%.

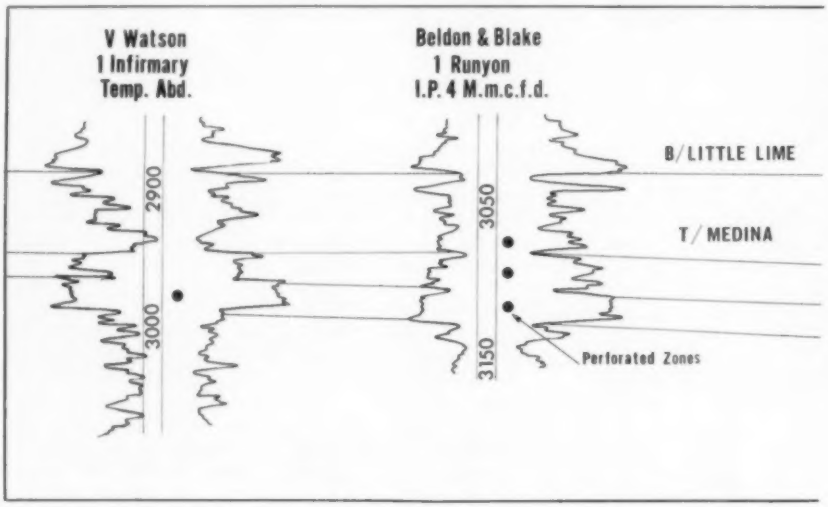
Shallow gas from Upper Devonian has been produced along Lake Erie ever since the area was settled. In Conneaut Township, wells drilled for water in 1870 reported gas shows from 50 to 600 ft. Much of this gas later was piped into homes for heating and cooking. The gas occurs in silty zones of the blue-black shales.

The first recorded oil and gas test in this area was drilled in the southeast corner of Denmark Township in 1899. It was drilled by the Ohio Fuel Gas Co. to a total depth of 2,400 ft., through the Lower Devonian-Austinburg sandstone. No other drilling took place until the late 1920's and early 1930's. It was during this period that the Medina (Lower Silurian) and Austinburg (Lower Devonian) production was found in Conneaut Township. The production and areal extent of both of these formations was unpredictable. Several wells were found with volumes ranging from 1 to 6 M.M.c.f.d. of gas.

The Ohio Fuel Gas Co. entered into an exploration program for this area then. They drilled a test well in eastern Kingsville Township, the 1 Nellie Rose (August 1930), which had a show of gas from 2,960-86 ft. in the Medina section, and they drilled a Cambro-Ordovician test in central Sheffield Township (May 1930). This test had a show of gas in the Medina sandstone, 3,022-95 ft., and had a hole full of salt water in the Gatesburg sandstone at 5,582 ft. (Cambro-Ordovician). Also, in September 1930, they completed a dry test in southeastern Sheffield Township. The total depth was 3,429 ft., through the Lower Silurian and into the Upper Ordovician shales.

Ten years elapsed before anyone took another look at the area. In 1940, the Ohio Oil Co. drilled three wells. Two were in northwestern Springfield Township, Erie County, Pennsylvania, just across the state line, in the northwestern corner of that state, and one was in Richmond Township. One of the two wells on the Pennsylvania side was drilled to the Gatesburg sandstone (Cambro-Ordovician), 5,191 ft., and found a show of oil, gas and salt water in this formation; the other was drilled into a porous salt-water-bearing zone (4,457 ft.) in the Middle Ordovician limestone (Trenton) (April 1942).

ASHTABULA COUNTY lies in northeastern Ohio.



long slumber

The third well in Richmond Township was completed November 26, 1941. The driller's log reported several shows of gas, one being in the Lower Silurian sandstone, 3,628-33 ft. The total depth was 3,841 ft., in the Upper Ordovician shales.

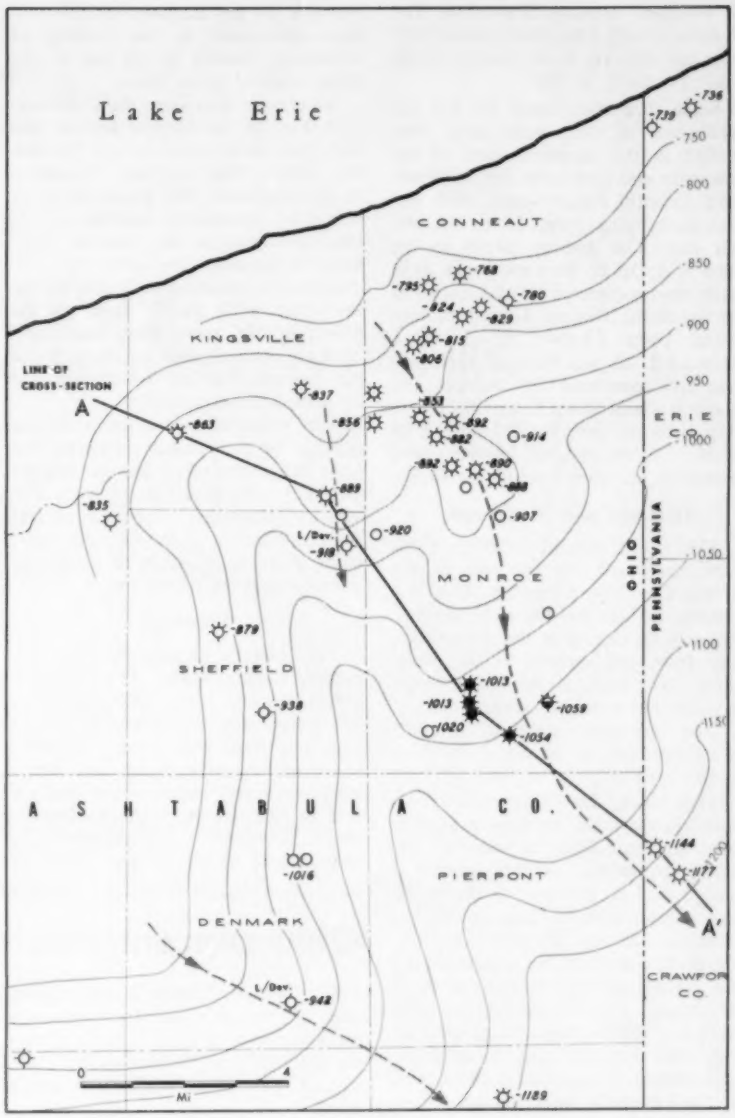
The early and mid-1940's also saw a revived interest in Conneaut Township. This drilling resulted in a half-dozen dry holes and one producing gas well.

In March 1951, Benedum-Trees Oil Co. drilled a Cambro-Ordovician test in Lenox Township (extreme southwestern corner of Fig. 1). This well was drilled 200 ft. into the Gatesburg sandstone and encountered salt water in this formation.

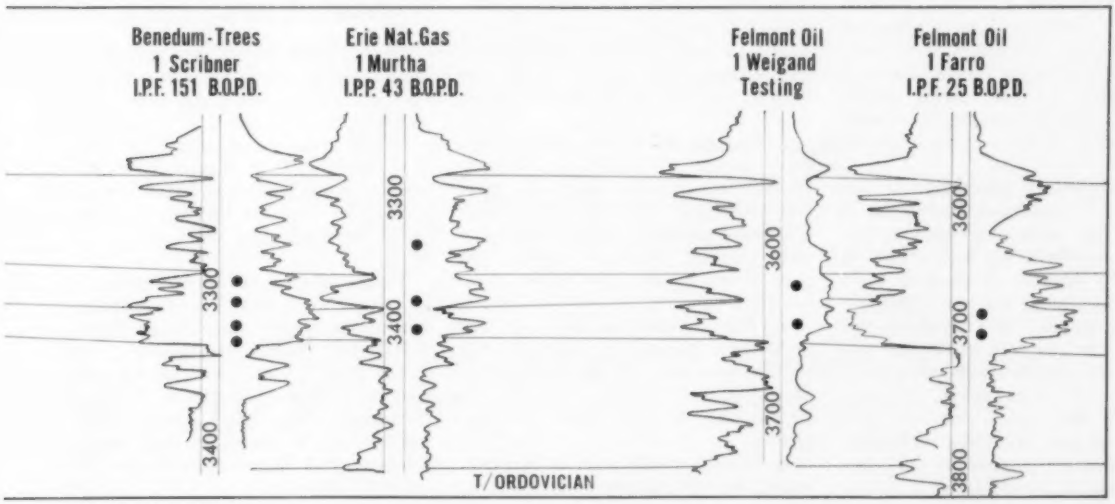
Recent Developments

In 1953, Russell McConnell et al. began drilling in northwestern Monroe Township. By 1955, he had completed four Medina gas wells with open flows ranging from 200 to 4,000 M.c.f.d. with a shut-in pressure of 1,050 psi. and average depth of 3,100 ft.

In 1957, Benedum-Trees discovered oil and gas in the Medina sandstone



STRUCTURE MAP (right, Fig. 1) is contoured on top of Lower Devonian. Correlated electric-log section (below, Fig. 2) along a northwest-southeast line A-A' indicates objective gas pay.



in southern Monroe Township. The discovery well, 1 Scribner, flowed 151 bbl. per day on ¼-in. choke (OGJ, Nov. 11, 1957, p. 283).

Since then, five more oil and gas wells and one dry hole have been drilled in this southern part of the township and across the line in Crawford County, Pennsylvania, with potentials ranging from 15 to 43 bbl. per day. The average depth to the sand is 3,450 ft. Two more gas wells have been completed by McConnell in north-central Monroe Township, with initial open flows of 3 to 8 M.M.c.f.d. of gas. One gas well was recently completed by Beldon and Blake in southeastern Kingsville Township with an initial open flow of 4 M.M.c.f.d. of gas. All of the above potentials are after fracture treatment.

Structure and Stratigraphy

Fig. 1 is a subsurface map of the area contoured on the top of the Lower Devonian limestone. This is a reliable marker for the old "toolies." There is no change in the shale lithology from the surface to this limestone. Not only is this a lithologic marker, but it is also a time marker; a "hot" radioactive streak of bentonite is encountered at its top everywhere in this area.

The Lower Devonian structure is conformable with the Lower Silurian structure some 1,400 ft. below it. The divergence in this 1,400-ft. interval is only 2 to 3 ft. per mile to the southeast. Unfortunately, because of the variability of the Medina sandstone, old drillers' logs of this formation are not reliable enough to attempt structure mapping on this formation. Until last year, electric logs and gamma-ray logs were not run and, in most instances, were not available when most of the key wells were drilled.

As can be seen from Fig. 1, a north-northwest south-southeast, south-plunging, anticlinal nose is mapped across Monroe Township. It is along this nose and on the flanks of it that the drilling is now taking place. Another southeast-plunging nose may be developed in the southern part of the map.

It is doubtful if production is limited to this structural nosing, since most of the wells that were drilled prior to hydrafracing had shows of gas in the Medina sandstones; however, it does seem that the better gas wells are located on and along this feature. The recently completed gas wells on this feature would have made wells prior to hydrafracing, with natural open flows from 500 to 1,300 M.c.f.d. of gas. The older wells that were drilled off this nosing only had small shows of gas (30 to 60 M.c.f.d.). Perhaps the gas migrated up this feature subsequent to the folding or wrinkling, thereby giving rise to the better natural open flows.

As can be seen from the cross-section (Fig. 2), the Medina section was laid down on a comparatively flat surface with a slight regional divergence to the southeast. This figure shows in detail, by gamma-ray neutron curves, the variations in the Medina sandstone in this area. The author has subdivided the sandstone in two members, the upper being the "C" zone and the lower the "D" zone. These two members are recognizable on the gamma-ray neutron, but are undifferentiated by sample examination.

The potentially productive formations above the Medina sandstone that have had shows of oil and gas are the Oriskany (Austinburg), Lower Devonian sandstone, and the Middle Silurian-Niagara dolomite. As more wells are drilled, either of these formations may be productive.

Lithology

The Medina sandstones are varicolored subgraywacke. The dominant colors are red, pink, and gray. They are usually interbedded with gray shale and red and gray sandy siltstone. Crossbedding may be present. These sandstones are shallow-water deposits and in part deltaic. Crinoids, lingula, and thin streaks of conglomerate are also present in the section. With the exception of the "C" and "D" members, the other sands come and go very rapidly from one location to another and, at this time, cannot be correlated. The "C" and "D" members exhibit rapid changes in sand-shale ratios, but are always present and recognizable by electric or gamma-ray logs.

Drilling Practices

All drilling is done by cable tools. Usually one joint of 10-in. drive pipe is set, then a water string, 8⅝-in., at 200 to 350 ft. An intermediate 7-in. string is set through the Lower Devonian section, which carries salt water. This will vary anywhere from 2,000 to 2,400 ft. It is set on a shoe and after the 5½-in. completion string is cemented, the 7-in. is pulled and used again in other wells. Some of the operators set their production string in the Little limestone, while others drill through, log, set their production string, and perforate. All of the wells are fractured. Fresh water, crude oil, or kerosine is used and the size of the job vary from 300 to 800 bbl. of fracture fluid. Drilling costs vary from $3.75 to $4.00 per foot, and completion costs are comparable to other active areas.

Reference

1. Rittenhouse,, Gordon, "Early Silurian Rocks of the Northern Appalachian Basin," 1949, Oil and Gas Investigations Preliminary Map 100, USGS.

Ohio concentrates on development

THE DEVELOPMENT and extension of oil-producing areas was the main concern of Ohio operators during the past year, although some wildcatting was done and some strikes made.

- A second discovery was made in Ashtabula County, this time a gasser, while the gas pool at Conneaut continued to develop. The most extensive wildcatting took place in eastern Holmes, Wayne and Coshocton counties.

Indications of two oil and two gas pools were found in Holmes County. In Wayne County a single gas pool was found and in Coshocton County a Clinton gas and a shallow gas pool were opened. Another shallow gas pool was opened in Tuscarawas County.

- The big play of the year was in Morgan County on discovery of a combination gas and oil well east of Malta. A field has not yet been confirmed, but several wells are now drilling.
- Moreland field with its two producing horizons continues as the most prolific while the Layland, Killbuck, and New Lexington pools are the most active.

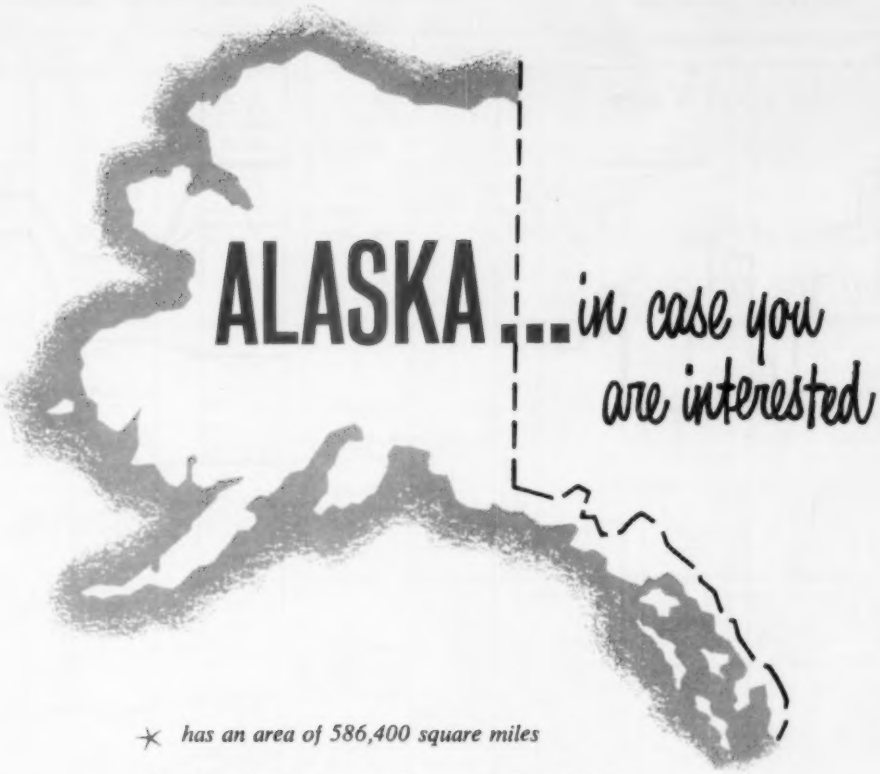
Spencer attracts Illinois basin bits

ONE OF THE BEST new areas in the Illinois basin is in Spencer County, Indiana. The discovery well was completed in October 1958.

It was Cato Enterprises-J. Abele-J. C. Westfall-J. R. Knapp 1 W. B. Machin in SE SW SE 6-7s-5w. Initial production was 128 bbl. per day on pump from the Aux Vases at 1,224-35 ft.

There are now 12 wells completed in Sections 6, 7, and 12. All produce in the Aux Vases. Initial gages from 50-100 bbl. per day are reported.

The area is 1 mile west of Grandvied, Ind. Cox Drilling Co., Calstar Petroleum Co., Otis Greer, Milt Yunker, C. W. Lee, Sr., Lohmann-Johnson, and Robert Lowry are all active in the play.



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- *was discovered by a Dane, Vitus Bering, in 1741*
- *has a 6,640-mile coastline*
- *has, as its approximate geographic center, a point in latitude 63° 46', longitude 152° 20'*
- *has produced some oil since the early 1900's*
- *has, as its state flower, the Forget-me-not,*

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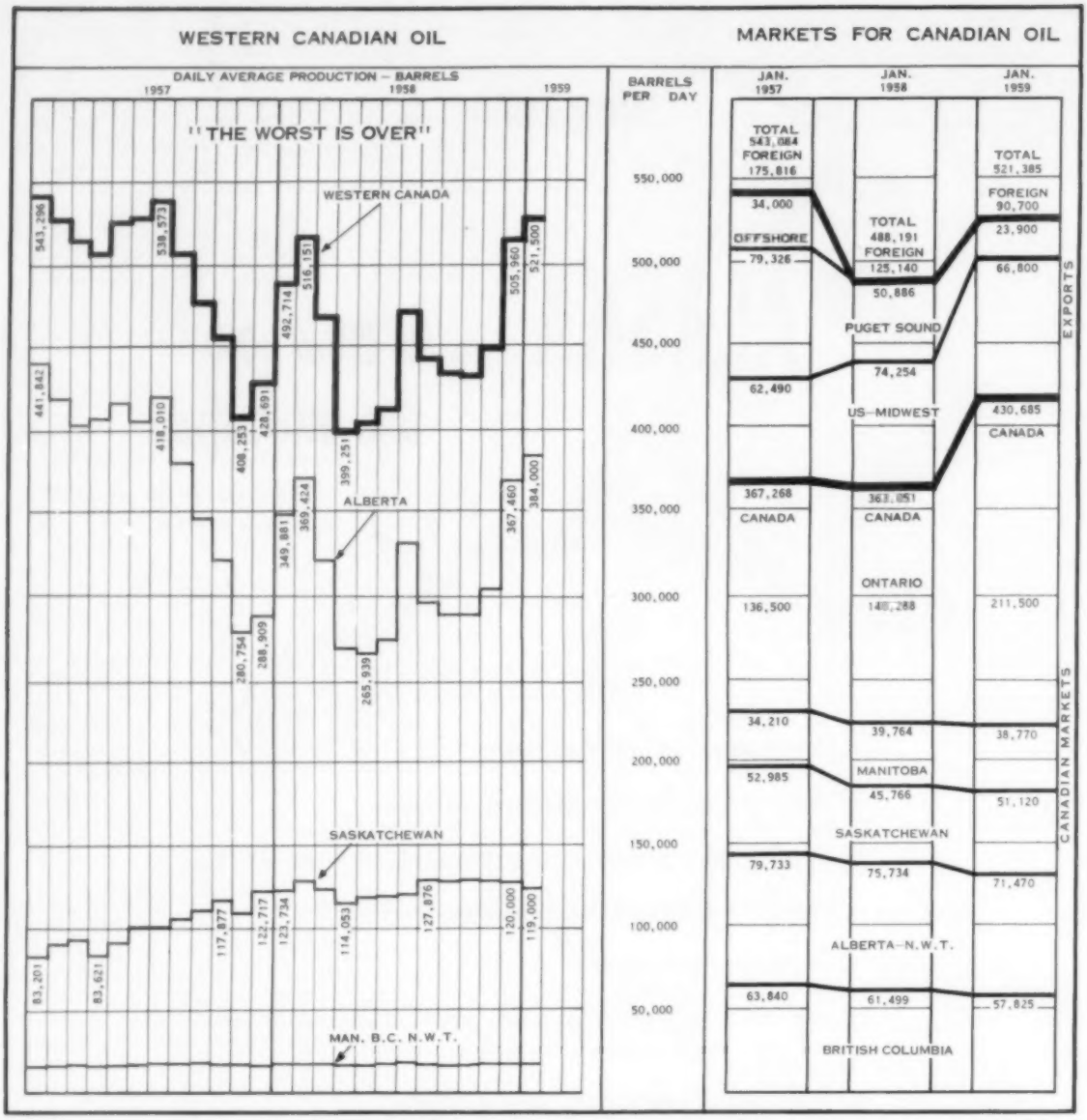

According to a report released by the Daily Oil Bulletin in Calgary, Western Canada's oil and gas industry tumbled back to a "third-best year" in 1958, when production, revenues, and investment slumped well below the all-time high record 1957 and slightly below 1956. Thus ended the unbroken string of 11 years of rapid expansion that, between 1947 and 1957, boosted the industry 25-fold in the nation's No. 1 source of mineral wealth. The New Year, at worst, promises a restoration of oil production and revenue levels comparable to 1957, and a continuation of exploration and development spending at better than one million dollars daily, but well short of the record levels of 1956-57. At best, the New Year can inaugurate a great new era in expansion of oil, gas, and byproduct development in Western Canada, with a broad favorable impact upon employment across Canada, and upon a host of industries across the nation. Decisions to be made mainly by governments will determine whether major hopes become realities.

Big Alberta discovery is completed

COMPLETION of one of Alberta's best oil discoveries of 1958 was reported by Pan American Petroleum Corp.

Pan American-British American Oil Co., Ltd. A-1 Swan Hills was finaled for 2,568 bbl. of oil per day. Its producing rate was established on the basis of a 24-hour potential test on a 1-in. choke.

A gross pay section of 361 ft., of which 204 ft. is net pay, was reported by the firms. It is the thickest pay section found to date in the promising Swan Hills area.

Production is from the Beaverhill Lake or Slave Point formation, which was topped at 8,850 ft. Swan Hills A-1 was drilled to a total depth of 9,279 ft. and plugged back to 9,200 ft.

The well has been assigned a discovery allowable of 490 bbl. of oil per day.

Swan Hills A-1 is located 2 miles southwest of the nearest Beaverhill Lake production. Pan American and British American share interest in the well and in 92,000 Crown reservation acres in a solid block surrounding the well. Pan American is operator.

Location of the well is LSD 14, 33-66-10w5.

Swan Hills drilling sets fast pace

ALBERTA'S famed Swan Hills region is running at high speed with winter drilling at its fastest clip yet. Shell Oil Canada, Ltd., reportedly has found oil in the Beaverhill Lake-Middle Devonian at its 6-34-64-13 Swan Hills wildcat, 4 miles southeast of Hudson's Bay-Home-Union 4-20-65-13 Virginia Hills.

The operator tested a 60-ft. section for 1 hour, recovering 1,140 ft. of oil and 1,570 ft. of heavily oil-cut and gas-cut water cushion. Of the 60 ft. tested, about 25 ft. appear to be net pay. The test was at 9,360-9,400 ft.

. . . **Other wells.** Half a dozen more oil wells were completed, and two others are being completed in the region, according to Home Oil Co., Ltd., operators of the field. The eight wells make up the first portion of the big campaign planned for the field this winter. Gross pay thickness of the wells ranged from 278 to 395 ft. of reef with net pay running from 87-148 ft.

Rigs have been moved from the new producers to new locations. Work is under way on the second stage of the winter's drilling program.

Drilling rigs keep active at Canada's Beatton River

CANADA'S Triad Oil Co. recently announced the current drilling program and results to date of its Beatton River oil discovery in northeastern British Columbia.

In the late winter of 1957-58 Triad found 40° oil in the Triassic "D" sand at its J-38-b Beatton River well at a depth of 3,734 ft. Production casing was run, and operations suspended for the summer months due to muskeg conditions. Operations were resumed this fall, and two drilling rigs are at work exploring and evaluating the area.

On the discovery hole, casing was perforated opposite the pay section and production tests are currently being carried out. Meanwhile, two additional oil producers have been drilled, namely Triad J-29-d, and J-39-d, located about ½ mile southwest and ½ mile northwest of the discovery hole. A fourth well is now being planned for a location about 1 mile southeast of the initial strike.

About 5 miles to the west, Triad K-39-d is being drilled, and a third rig will be moved onto a location about 2 miles northwest of the present producers. Initial producing potential of wells completed range up to 1,000 bbl. per day and sand thickness thus far varies from 10 to 25 ft.

The present drilling program is being conducted on a 199,000-acre permit block situated a few miles southeast of a similar block. Triad has a 100% interest in both blocks until all exploration and development costs are recovered and a 70% interest thereafter.

This new oilfield of northeastern British Columbia lies about 4 miles northwest of the Union-H. B.-Milligan Creek oil discovery which produces from a similar depth, also in the Triassic formation. It is not yet certain whether the two pools may be separate or connected. However, with the above-mentioned program as well as one being carried out around the Union-H.B. successes it shou'd not be too long before that situation is defined.

Dominion Drilling Co. of Calgary was awarded job of drilling the two new wildcat tests scheduled for the area by Triad; while Guthrie McLaren Drilling Co., Ltd., already had one rig working on development for the company.

Two wells flow at Milligan Creek

IN CANADA, Union Oil Co. reported completion of two more flowing oil wells in a block of a million acres it holds jointly with Hudson's Bay Oil Co. in the Milligan Creek field along the borders of British Columbia and Alberta, Canada.

The wells each flowed 40°-gravity crude oil at the rate of 300 bbl. a day through a restricted bean from the Triassic sands at a depth of 3,800 ft.

With four producing wells already completed, a pipeline into the area is scheduled for completion the middle of 1959.

An accelerated exploratory program in addition to development of the area where production has been established is being conducted in the field which Union and Hudson's Bay discovered in 1957.

Deep granite test

In Eastern Kentucky, United Fuel Gas Co. projected deep granite test 1 J. W. James is drilling ahead with heavy rotary tools at 2,363 ft.

This rank wildcat test is located on Coldwater Fork about 1 mile south of Inez, the county seat of Martin County.

South Oklahoma picks up find

SOUTHERN OKLAHOMA'S active Ordovician campaign picked up another good discovery. Kingwood Oil Co. found good production at its 1 Cameron at Lindsay in NW NW 32-5n-3w, McClain County.

A test of the first Bromide sand at 9,730-90 ft. got 196 bbl. condensate and 2,500 M.c.f. of gas on 21/64-in. choke in 24 hours. The Oil Creek sand gave up 276 bbl. condensate and 11,500 M.c.f.d. of gas on 21/64-in. choke through open hole in 24 hours.

Open-flow potentials of this well are estimated at 576 bbl. of condensate per day and 12,500 M.c.f. of gas from the first Bromide sand; 768 bbl. condensate and 32 M.M.c.f.d. of gas from the Oil Creek sand.

Major County gets Cherokee oil

CHEROKEE-PENNSYLVANIAN oil production is reported in the prolific Northeast Cheyenne Valley field area of Major County, Oklahoma.

J. M. Huber Corp. 1 Case, C SW NW 7-21n-14w, southwest of the field, flowed 410 bbl. of oil per day with a gas-oil ratio of 473:1. Perforations are at 7,052-92 ft.

North Dakota field extends

A NORTH DAKOTA extension well flowed 1,200 bbl. per day on completion to open the new drilling year in the Williston basin with a bang. Pan American Petroleum Corp. completed its 1 Bly in SW NE SE 27-163n-92w, Burke County, in Midale and Nesson Mississppian, extending South Rival field to the north.

Perforations were at 6,170-90 and 6,197-6,210 ft. The field discovery well, Northern Pump 1 Bywater, NE NE SW 34-163n-92w, was completed last spring for 216 bbl. of oil daily on 15/64-in. choke. The field has four producers with production from both Midale and Nesson pay.

Las Animas hunt moves to Nebraska

NEBRASKA'S 1959 center of wildcat interest will likely be the southwest corner of the state just north of the growing Pennsylvanian reservoir in northwestern Kansas. The first discovery of the New Year for this new province is at Skelly Oil Co.'s 1 Lewis in SE SE SE 26-1n-32w, Hitchcock County, Nebraska.

The well was completed on pump for 143 bbl. of oil daily from perforations in the Lansing-Kansas City at 3,862-66 ft. This newest addition to the growing chain of fields along the northeastern portion of the Las Animas arch and its associated arches, the Cambridge and Chadron, is more than 21 miles northwest of Kansas production.

There are a few other small Pennsylvanian fields in this portion of Nebraska, but the big oil to date has been in Kansas at Llanos field in Sherman County.

Nebraska, Kansas share oil finds

A TEXAS FIRM, Drilling & Exploration Co., Inc., et al., are completing three new wells at approximately the same time. One of the new wells is a discovery in Nebraska, and two are extension wells in Kansas.

... **Nebraska.** Drilexco, et al., have a discovery in Kimball County, Nebraska, as 1 Spath nears completion. A "J" sand producer is in prospect from this well which was drilled to a total depth of 6,277 ft. It was cored from 6,248-61 ft. and recovered sand with good stain and porosity; 4½-in. casing was set at 6,276 ft. After perforating at 6,251-62 ft., the well swabbed at the rate of 10 bbl. of oil per hour natural, and is in process of being placed on production.

This wildcat is the third discovery in Nebraska by Drilexco since September. Last October, the company completed 1 Forest Hinshaw and 1 Hawthorne—both in Kimball County and both "J" sand discoveries. The company owns an undivided one-fourth interest in a block of 13,000 acres in Kimball County on which it is conducting exploration and development activities.

... **Kansas.** Two extension wells are being completed in the Spivey-Grabs area of Kingman County in southern Kansas. The 1 Calkin "A" was drilled to a total depth of 4,557 ft. Through a 20/64-in. choke, from perforations at 4,135-45 ft., the well flowed at the rate of 2,122 M.c.f. of gas.

... **The Wooldrige.** This extension well was carried to a depth of 4,260 ft. Through a 20/64-in. choke, opposite the intervals from 4,160-70 ft., the well flowed, on a preliminary open-flow potential (pipeline test), at the rate of 120 bbl. of oil and 10.8 M.M. c.f. of gas in 24 hours. Final open-flow tests will be calculated when pipeline company makes the final connection in January.

This activity in Kansas is the result of an acquisition by Drilexco some 5 months ago. Last July, Drilexco and associates acquired leasehold interest on acreage totaling some 150,000 acres from Lion Oil Co. division of Monsanto Chemical Co.

The properties are spread over 32 counties in central, western and southern Kansas, and a small portion in Hayes County, Nebraska.

Denver basin field confirmed

THE CONFIRMATION discovery well of Singleton field in Banner County, western Nebraska, was completed for a pump gage of 303 bbl. daily. The well is Sinclair Oil & Gas Co. 1 Singleton, C NE SE 19-17n-53w.

Production at this Denver basin well is from "J" Dakota sand perforations at 5,569-79 ft. The field discovery well is Miracle & Fifer Drilling Co. 3 Singleton in W½ NW SE 19-17n-53w. It made 360 bbl. of oil per day on pump last November on completion.

Sacramento area gas field opens

IN CALIFORNIA Humble Oil & Refining Co. has a new gas-field discovery in northern California.

The discovery well, 1 James W. Morgan, is located 4½ miles southwest of the South Dome gas field and 4½ miles south of the town of Corning in Tehama County.

Completed in an interval at 4,022-53 ft., the discovery was making 1,118 M.c.f.d. through a ½-in. choke. The location is in SW NW 9-23n-3w.

Humble was also successful with an extension test of a gas pool it originally discovered in 1956 at Bounde Creek in Glenn County. The extension, 2 Bounde Creek, is about 800 ft. north of the pool discovery well.

Drill-stem tests of two intervals were made with these results: on test of an interval at 5,500-21 ft. and 5,541-47 ft., it flowed at a rate of 5,146 M.c.f.d. A similar test of the two intervals plus another at 5,420-50 ft. flowed at a rate of 5,741 M.c.f.d.

A shallower interval at 2,874-77 ft. tested for 1,870 M.c.f.d. Still another shallow interval at 2,842-67 ft. indicated production possibilities with gas to the surface in 2 minutes and still cleaning up after 15 minutes.

West Texas field adds second well

EAST COGDELL (Canyon) pool of northeastern Scurry County gained its second well at Drilling & Exploration Co., Inc., 2 P. L. Fuller. Location is 14 miles southwest of Clairemont and 1½ miles east of Cogdell field, in Section 707, Block 97, H&TC Survey.

Top of the reef in 2 Fuller at 6,797 ft. was said to be 33 ft. higher than in the field discovery, 1 P. L. Fuller. On potential test the confirmation flowed at the rate of 15 bbl. of oil an hour through ¾-in. choke, from perforations at 6,840-56 ft.

Drilexco owns a 60% interest in 80-acre tracts checkerboarded in the immediate area. Further development of the acreage is scheduled for the first part of 1959.

Big Tyler pool opens in Montana

TYLER-MISSISSIPPIAN oil production was established on the Montana plains at Honolulu Oil Corp.'s 11-9 Stensvad in NE SE 11-11n-31e, Rosebud County.

The well was completed officially for 448 bbl. of oil per day on 24/64-in. choke from Tyler perforations at 5,308-80 ft. Location of this new field is 1½ miles northwest of Sumatra field and 2½ miles northeast of Ivanhoe field.

Oklahoma's North Buffalo grows

PRODUCTION is reported at an east stepout test in North Buffalo field, Harper County, northwestern Oklahoma.

An-Son Petroleum Co. 1 Miller, C NW NW 8-28n-22w, tested both oil and gas in the Lansing-Pennsylvanian lime. This multipay field is one of the best new areas in the busy northwestern Anadarko basin.

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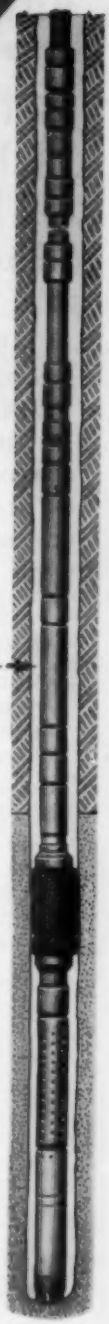

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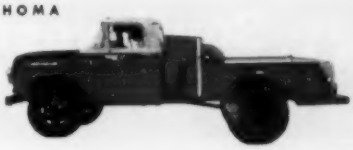

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By Kenneth K. Landes, University of Michigan

This practical work provides useful field data on the occurrence, distribution, and technique of location of gas deposits and oil reservoirs—plus a clear explanation of the theories developed to explain the origin, migration, and accumulation of oil and gas. ". . . deserves commendation," say *Geophysics Magazine*, "for its many fine illustrations . . . ; its wealth of references, which completely document every facet of the discussion and indicate an amazing familiarity with the literature . . . ; and for the informal style of writing which keeps the material interesting in spite of a mass of facts and data that in the hands of a less skilled author would consign the book to dusty references shelves." 1951. 660 pages. $11.00.

THE OIL AND GAS JOURNAL
Reader Service Department
P. O. Box #1260 Tulsa, Oklahoma

North Texas hit

A SHALLOW WILDCAT in Cooke County was ready for completion attempt after recovering 1,040 ft. of 42° oil on drill-stem test of an unidentified sand zone.

Star Oil Co., Inc., 1 Lee G. Thrasher ran casing to 2,848 ft. after getting the 1,040 ft. of oil, plus 600 ft. of heavily oil-cut mud on test at 2,849-50 ft. Flowing pressure ranged to 225 psi.

Location is in the J. A. Hooper Survey, A-1229. It is 6 miles north of Woodbine townsite and about 1 mile south of production in Callisburg field.

Eastern area busy

NEW YEAR EXPLORATION in Pennsylvania includes several important wildcat developments.

Peoples Natural Gas Co. 1 James S. Blair in Donegal Township, Westmoreland County, was completed as a new-field discovery. The well is located on the Seven Springs anticline. Production of 3,663 M.c.f. of gas is from the Onondaga chert with rock pressure of 3,250 psi. in 10 days. The well went to total depth of 7,831 ft. with no fracturing used.

... **Somerset County.** A previously reported well in Elk Lick Township, Manufacturers Light & Heat Co. 1 Bender, is to be plugged and abandoned. The well was drilled on the Negro Mountain anticline. It found 1,500 M.c.f. of gas after fracture in the Onondaga chert. But it came on to salt water after fracturing the Oriskany, ruining the well. Another well, about 3 miles northeast, was dry in the Onondaga chert and Oriskany, and has been plugged.

... **Westmoreland County.** Peoples Natural Gas Co. 1 Latrobe Construction Co. has been completed as a new pool opener in a separate fault-block to the northeast of McCance pool. This discovery is on the Chestnut Ridge anticline in Ligonier Township. After fracture, it made 1,087 M.c.f. with a 10-day rock pressure of 3,590 psi. Gas is from the Onondaga chert. Total depth is 7,825 ft.

... **Erie County.** A new field wildcat in Conneaut Township, northwestern Pennsylvania, is Britton et al. 1 Edna Roberts. It was completed at total depth of 3,265 ft. with an open flow after fracture of the Medina-Silurian section of 2,304 M.c.f. and rock pressure of 965 psi. in 1 month.

Another Erie County wildcat, the 1 Pierce, drilled by Lake Shore Natural Gas Co., found over 500 M.c.f. of gas in Medina sand. The well is being tested after fracturing.

Muddy pool opens in Wind River

WIND RIVER BASIN news included a new discovery at Batzer Oil Co.'s wildcat at Federal Bridge in Natrona County, Wyoming. The 1 Government, C NW SW 26-31n-82w, flowed gas at the daily rate of 2,025 M.c.f. from Muddy - Cretaceous at 2,482-2,500 ft.

Location of this apparent pool opener is 3 miles southeast of Federal Bridge field, a Steele shale producer.

Paradox depth record set

ONE of the year's significant dry holes was completed last week by Continental Oil Co. in the Colorado portion of Four Corners. The 1 Scorup et al., SW SW SW 8-47n-18w, Montrose County, went to 15,000 ft. This makes it the deepest well yet drilled in the Four Corners region.

Total depth was in Mississippian

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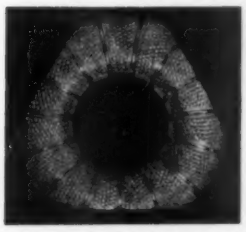

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THE OIL AND GAS JOURNAL

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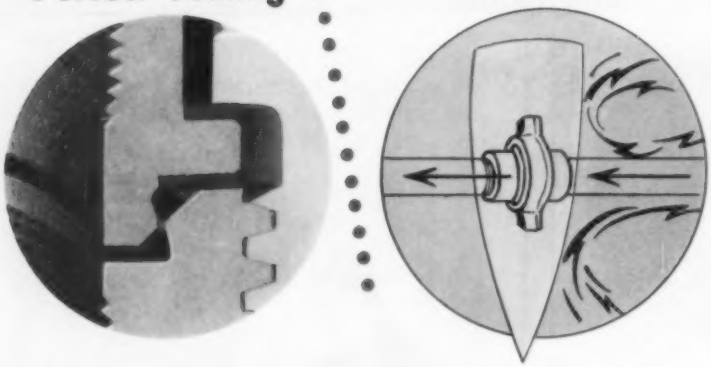

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rocks. The Mississippian was topped at 14,760 ft.; the Molas-Pennsylvanian at 14,677 ft. Continental took drill-stem test at 14,780-15,000 ft., recovering 8,500 ft. of salt water and 4,950 ft. water cushion in 2 hours.

Several cores were taken below 8,448 ft. but no shows were reported. The operator ran surface pipe to 1,220 ft., but no other casing was set, making it one of the deepest open-hole projects ever drilled. The well also drilled in salt through 90% of the entire depth of the hole.

Reef play looms in Michigan

A NEW NIAGARAN reef play showed promise with Russell Fletcher and Fisher-McCalls 1 Krause, NW NE NW 11-3n-15e, St. Clair County, logging free oil at 2,460-64 ft. Casing was cemented for production test after first of the year.

Semiwildcat location is ½ mile south of a gas well and about 6 miles southeast of the Peters reef oil play. Test is on a Carter Oil Co. farmout.

● Mask & McClures 1 Rossenau, 23-3s-4w, Calhoun County, flowed 296 bbl. in 24 hours natural with 26/64-in. choke on first round-the-clock production test. Well is producing from Trenton dolomite, bottomed at 4,324 ft. The outpost, 10 miles northwest of Scipio field, is viewed as most significant development of year, and certain to step up exploratory rates in southern Michigan. Carter Oil Co., Aurora Gasoline Co., and Mask & McClure have offset acreage to the discovery.

Texans examine Brazos Valley

THE Houston Geological Society, 234 Mellie Esperson Building, held a field trip to examine outcrops of the Middle Tertiary formations extending from the Lower Oligocene to the Middle Eocene along the Brazos River Valley. This Texas trip had some 250 active participants.

For the guidance of the party, an excellent guide book was prepared by Professor Fred E. Smith of Texas A. & M. College with the assistance of the field-trip committee of the Houston Geological Society and members of the Gulf Coast section of the Society of Economic Paleontologists and Mineralogists.

A limited number of copies of this guide book are available from the society for $3.25.

These Texas areas made oil news:

Freestone

A 12,500-FT. WILDCAT has been scheduled for southeastern Freestone County. Humble Oil & Refining Co. has made location for its C-2 Greer Brothers 4 miles southwest of Butler and about ¾-mile southwest of Woodbine production in the Butler field area.

Projected depth is 12,500 ft., which should penetrate the Travis Peak. Location is on a 563-acre tract in the Andres Telano Survey, A-605.

Shelby County wildcat . . . Carter-Jones Drilling Co., Kilgore, was moving in for a Travis Peak test 13 miles southeast of Shelbyville in Shelby County. Proposed operation is 1 Pickering-Smith Unit, located on a 105-acre tract in the Archibald Smith Survey, A-641. Projected depth is 7,000 ft.

Nearest production is 2 miles to the northwest in Husley field, which produces from the Rodessa and Pettet formations. No. 1 Pickering-Smith Unit is ½-mile southeast of a 6,592-ft. dry test drilled in 1949 by Pure Oil Co. Pure's well had a small amount of gas on test at 6,572-92 ft.

Ochiltree

AN Upper Morrow sand discovery well in Ochiltree County, Texas, has been reported by Apache Oil Corp., Tulsa.

It is the 1 Hancock, NW NW Section 53, Block 4, GH&H Survey, in the Sand Boese extension area.

On a drill-stem test in the Upper Morrow from 7,488-7,620 ft., gas surfaced in 11 minutes and the recovery included 3,000 ft. of gassy oil and 600 ft. of oil and gas-cut mud. The tool was open 40 minutes and shut in 20 minutes.

Initial flow pressure was 405 lb.; final flow pressure, 775 lb.; shut-in pressure, 1,950 lb.

Apache this year also has had discoveries in Hemphill and Lipscomb counties, in the Panhandle.

Terrell

IN TEXAS, Continental Oil Co. 1 Brown-Bassett, located on the northwest end of Brown-Bassett gas field in Terrell County, reported gas gages from the Silurian section.

Testing through 12/64-in. choke, from perforations in the Silurian at 12,604-14 ft., the well flowed at the rate of 3,500 M.c.f.d. Operators prepared to acidize the section and continue testing.

Earlier, the well flowed gas from Ellenburger perforations at 13,924-30 and 13,933-39 ft.

The field pay opener in the Silurian, Magnolia Petroleum Co. 1 Brown-Bassett, was completed for an open-flow potential of 75 M.M.c.f.d. of gas from perforations at 12,387-12,446 ft.

Nolan

SOUTHERN Nolan County is in line for a 7,500-ft. rotary wildcat by Seneca Oil Co., Oklahoma City. The test will be 1 J. H. Nail, in Section 21, Block 12, H&TC Survey.

Location is 1½ miles west of Nena Lucia Strawn reef field in the southwest portion of the county. It is being drilled on a farmout from Standard Oil Co. of Texas.

Midland

A PENNSYLVANIAN discovery has been assured in southern Midland County, 20 miles southeast of Midland townsite.

The well is TXL Oil Corp. 1 W. Bryant, Section 6, Block 38, T4S-T&P Survey. The well gaged 150 bbl. of oil in 24 hours through 32/64-in. choke, under tubing pressure of 100 psi., and with gas-oil ratio of 4,060:1. When changed to 28/64-in. choke, the well made 140.28 bbl. in 24 hours. Total depth is 12,546 ft.

Location of 1 Bryant is approximately 3 miles west of production in the Spraberry Trend area and 3 miles southeast of a 13,822-ft. dry hole.

Successful wildcats

CALIFORNIA

Kern County: Union Oil Co. of California, 77-16 Union-Hancock-Shaffer-Brite, SE SE 16-31s-29e, 465 BOPD, 33.6° gravity, 4.3% cut, 18/64-in. choke, perfs. 8,114-8,314 ft., TD 8,494 ft. (New pool discovery in Jewett sand in northeast Stenderup area of Mountain View field).

WESTERN CANADA

Alberta: New Superior et al. 1-2-35-4 Garrington, LSD 1, 2-35-4w5. Cardium oil discovery. TD 6,358 ft.

Imperial-Western 6-35-27-6 Wildcat Hills, LSD 6, 35-27-6w5. Mississippian gas discovery. TD 10,821 ft.

MICHIGAN

Allegan County: Imperial Oil Co. 1 Funk, SE NW NE 14-4n-13w, Salem Township, 2-mile extension, Salem field: 76 M.c.f. gas. Elevation 668, Detroit River 2,096, Salina A-2 2,779, TD 2,796 ft. (Extension to Salem).

Calhoun County: Tom Mask and McClure Oil Co. 1 Rosenau, NW NW SW 23-3s-4w, Albion Township, 10 miles northwest Scipio oil field, IPF 296 BOPD, 26/64-in. choke. Elevation 989, Salina shale 2,287, Brown Niagaran 2,705, Trenton 3,888, pay gas 3,900, oil contact 4,090. TD 4,324 ft. New oil field.

Newaygo County: E. L. Hess 1 Butler, SW NW SW 6-11n-11w, Ensley Township, 8 miles southeast Kimball Lake oil field. Elevation 813, Marshall 826, pay 826-31. TD 900 ft., gage 560 M.c.f. gas. New gas field.

McClure Oil Co. 1 Buesch, SW NE NE 8-12n-14w, Sheridan Township: IP 22 BOPD. Elevation 768, Traverse lime 2,100, pay 2,100. TD 2,101 ft. (New oil pool).

SOUTHEAST NEW MEXICO

Eddy County: Tennessee Gas Transmission Co. 1-B Kelly-State, 27-24s-27e. IP 218 M.c.f. gas, Permo-Pennsylvanian 10,654 ft. TD 12,654 ft. Canyon 10,980 ft., Atoka 11,530 ft., Morrow 11,870 ft. Elev. 3,254 ft.

NORTH TEXAS

Archer County: Perkins-Prothro 1-E Farmer, Blk. 49, Bell CSL Sur., 6 miles northeast of Megargel, 1½ miles south of Dupriest-Mississippian field. IP 132 BOPD, 12/64-in. choke, 42°, GOR 520:1, TP 490 psi., Mississippian pay 5,030 ft. TD 5,072 ft.

Wise County: Kerr-McGee Oil Industries, Inc. 1 Matzinger Unit, E. W. Gregory Sur., A-346, 4½ miles southwest of Paradise, in Boonesville Bend gas field. IP 130 BOPD, 21/64-in. choke, 45°, GOR 1920:1, Caddo 4,273-90 ft. TD 6,147 ft. Ground elev. 811 ft. Originally completed June 25, 1958 as gas well.

Young County: H. R. Britton 1 Rosser, N. J. Timmons Sur., A-1257, 2 miles east of South Bend, 2 miles northeast of production. IP 187 BOPD, 10/64-in. choke, 41°, GOR 600:1, TP 700 psi., pay 3,985-90 ft. TD 4,043 ft.

EAST TEXAS

Harrison County: Barnwell Drilling Co. 1 L. Manning, Wm. Williams Sur., A-575, 2 miles east of Blocker. IP 120 BOPD, ¼-in. choke, TP 50 psi., 4,287-93 ft. TD 6,524 ft. New pay in Bethany field.

WEST CENTRAL TEXAS

Palo Pinto County: A. J. Frazier et al. 1-C Seaman estate, Olinda West Sur., A-1202, P-339, 6 miles northwest of Brad. IP 168.5 BOPD, 14/64-in. choke 40°, GOR 1,700:1, TP 1,120 psi., pay 4,015-21 ft. TD 4,095 ft., elev. 1,196 ft.

Throckmorton County: Tennessee Gas Transmission Co. 1-C Howsley, BBB &C Sur., 5 miles southeast of Throckmorton. IPP 70 BO in 16 hours, GOR 650, Mississippian 4,672-80 ft. TD 5,154 ft., elev. 1,316 ft.

WEST TEXAS

Crockett County: Spero T. Constantine 1 Shannon estate, Sec. 26, Blk. GG, 5 miles southeast of Iraan. IP, open flow, 3,180 M.c.f.d. gas, Queen sand 2,124-29 ft. TD 2,129 ft.

Garza County: Wilson Exploration Co. 1 Connell estate, 65-5-GH&H Sur., 6 miles east of Post. IPP 1001 BOPD, 36°, GOR 480:1, San Andres 2,984-90 ft.; IPP 51 BOPD, 38°, GOR 640:1, Glorieta 3,057-60 ft. TD 8,328 ft., PB 3,114 ft.

Loving County: Ike Lovelady and Robert B. Holt 1 Lindley, 32-54-T2-T&P Sur., 7 miles northwest of Mentone. IP 25.8 BOPD, ¼-in. choke, 36.6°, GOR 1,940:1, TP 125 psi., Delaware 4,138-46 ft. TD 4,224 ft.

Canada's Future Looks Bright

. . . to new president of Royalite. Hay has the background to direct operations of fast-moving Canadian company.

ONE OF CANADA'S small but vigorous integrated independents is pushing ahead, under new leadership, for still a bigger share in the growing Canadian market. The company is Royalite Oil Co., Ltd., of Calgary. The new leadership is provided by Charles Hay, 56, who was elected president of Royalite in October.

Hay looks to the future with optimism. Royalite, along with other Canadian companies, felt the effects of the recession and the decline in Canada's export markets. But it now appears, he says, "that the industry is gradually regaining confidence in its ability to market increasing quantities of crude oil and gas."

He credits this growing confidence to two developments: A better reception of oil-industry problems by the government, and the conviction that the trend to consolidate petroleum resources in North American will continue.

Charles Hay

No newcomer . . . Hay is not new to Royalite nor to oil. He has been with the company or its predecessors since he started in oil in 1931. Previous to that his experience was rather varied.

He graduated from the University of Saskatchewan in 1925 as a civil engineer. While in school he helped earn his tuition by working the night shift with an express company and by summer vacation work on a section gang for the Canadian Pacific Railroad. After graduation he lectured on engineering at the university while doing postgraduate work.

Hay went to work for Gibbs Brothers, a Saskatchewan road-building firm, in 1927. The company later became Gibbs Brothers and Hay Co. In 1931 the company joined with other interests to build the small Regina Hi-Way Refiners, Ltd., refinery. This launched Hay's oil career.

Ten years later he was general manager in charge of manufacturing for Saskatoon Hi-Way Refineries Co., successor to Regina. In 5 more years he had become its president. In 1954 Saskatoon was acquired by Royalite. Hay became a vice president and director of Royalite in 1955 and executive vice president in 1956.

Hay is both vigorous and athletic and has been described as a "rugged individualist." While in school he participated actively in hockey and football. He played on the hockey team that reached the Allen Cup finals in 1923.

He was born in Kingston in 1902, and 9 years later moved with his family to Saskatoon where his father operated a farm-machinery business.

Hay married Florence Miller of Lumsden, Sask., in 1928. They have three children and one grandchild.

Sales climb . . . The fact that Royalite is a fast-growing company is apparent from its sales record. In 1953 it had gross revenues of $8,500,000. In

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▶ ▶ ▶ Personals

E. Steltzer, formerly with Mobil Oil do Brasil, Ltda., has joined Naph-Sol Refining Co., Muskegon, Mich., as chief chemist.

C. G. Orem has been transferred by Northern Natural Gas Producing Co. from Billings, Mont., to Midland, Tex., where he will be district geologist.

Oran L. Haseltine, formerly senior production engineer in Los Angeles for Signal Oil & Gas Co., has joined Southern Union Gas Co. in Farmington, N. M., as drilling superintendent.

Wallace K. Belin, formerly general manager of Monsanto Mexicana, S.A., has joined the development department of Monsanto Chemical Co.'s inorganic-chemicals division in St. Louis. **J. C. Bovankovich** has joined Monsanto's engineering department, research and engineering division, in St. Louis.

William R. Connole has been elected 1959 vice chairman of the Federal Power Commission. He succeeds **Frederick Stueck,** who has held this post for the past 2 years.

Guffey Tuttle and **Jim Heckavy,** petroleum engineers, have joined Socony Mobil Oil de Venezuela in Anaco, Venezuela. Tuttle is a recent graduate of Texas A & M College. Heckavy is a recent graduate of the University of Texas.

Berk Strotham, The California Co., has been elected 1959 president of Dakota Oil Scouts. Other officers are **R. C. Zimmerman,** Phillips Petroleum Co., vice president; **Gene Luckemeyer,** Continental Oil Co., secretary; **W. S. Adolph,** Mobil Producing Co., treasurer; and **Charles Kelly,** Sun Oil Co., editor. Directors of the association will be **Charles Skjod,** Amerada Petroleum Corp., past president of the group; **Lee Newberry,** Pan American Petroleum Corp.; and **Charles Steiglitz,** Atlantic Refining Co.

George D. Lindberg has been transferred by Sun Oil Co. from Toledo to Mount Pleasant, Mich., where he will be regional geologist.

Louis A. Walstrom, Jr., Pan American Petroleum Corp., has been elected 1959 president of the Bismarck, N. D., Landmen's Association. **Norman F. Lestina,** Gulf Oil Corp., is vice president. Other officers are **Robert C. Heinley,** The California Co., secretary, and **Earl F. Reed,** Ohio Oil Co., treasurer.

Ralph S. Fowler, assistant director of the Interior Department's Office of Oil and Gas, has decided to leave government service January 31 to join a U. S. oil company operating overseas. He declined to identify the company. His new job is expected to start about mid-February. A former vice president of Arabian American Oil Co., Fowler joined Interior during the Suez crisis in 1956. He later worked briefly for the Office of Defense Mobilization before taking his present post last July.

1957 they were up to $30,500,000.

Royalite operates four refineries, one at Kamloops, B. C., and three in Saskatchewan, at Saskatoon, Prince Albert, and Coleville. Some of Royalite's gas goes to California through the Westcoast pipeline, and the company also ties in with Trans-Canada. It has 186 miles of trunk line and 88 miles of gathering lines.

Royalite is engaged in one of the industry's most fascinating problems: How to produce oil economically from the bituminous sands at Mildred Lake. It is possible that the first test of nuclear power to produce oil will be made in this northern Alberta area.

In addition to the presidency of Royalite, Hay also heads a number of subsidiaries. These include Royalite Hi-Way, Ltd., which operates the Saskatoon refinery and markets in the province of Saskatchewan; Saskatoon Pipe Line Co., Ltd., operator of a 56-mile line between Saskatoon and Interprovincial pipeline; Mid-Saskatchewan Pipe Lines, Ltd., which owns and operates a 35-mile line between Smiley and Ermine, Sask.; and Bituminous Oil Pipe Line, Ltd. He also heads Producers Pipe Line Co., Ltd., and Westspur Pipe Line Co.

Hay is one of the original directors of the Canadian Petroleum Association, Saskatchewan section, and served as its chairman in 1953-54. He is also a past member of the senate and board of governors of the University of Saskatchewan.

Mark Olson, petroleum engineering and geological consultant, has moved his offices to McAllen, Tex., from Rio Grande City, Tex.

John D. Wilkie, special representative of Ohio Oil Co. in Casper, Wyo., has retired after 34 years with the company. He had held his present post since 1956.

Paul G. Blazer, Jr., has been named manager of national account sales for Ashland Oil & Refining Co. Blazer has been with the company since 1947.

Dr. Peter J. Lucchesi has been named head of the exploratory section in Esso Research & Engineering Co.'s process-research division. **Harry M. Hartzband** has been named head of the Powerforming section, process-research division. A graduate of New York University, Lucchesi joined Esso Research in 1955. Hartzband joined the company in 1948. He is a Columbia University graduate.

R. C. Hartmann, junior exploitation engineer with Shell Oil Co., has been transferred to Tulsa from New Orleans.

Anthony Vincent Messineo, Atlantic Refining Co.'s regional electric log analyst in Tulsa, has been promoted to chief electric log analyst in Dallas.

A. S. Johnson, assistant Dubach, La., district superintendent for Southwest Gas Producing Co., Inc., has been promoted to district superintendent. Johnson joined Southwest in 1947.

Karl W. Shimeall, vice president of southwestern operations for Crown Central Petroleum Corp., has retired. He will continue as a director of the company, however. Shimeall was with Continental Oil Co. at the Ponca City, Okla., refinery before joining Crown Central in Houston in 1932.

Alan C. Harrop, formerly manager of the employe-relations department for Imperial Oil, Ltd., has been elected a director. Harrop served as superintendent of Imperial's Montreal East, Sarnia, Calgary, and Regina refineries before becoming head of employe relations in 1951. He was also superintendent of International Petroleum Co.'s Talara, Peru, refinery at one time.

F. P. Gulen, Standard Oil Co. of California, has been elected president of the Pacific Coast Oil Scouts and Landmen's Association. Others named by the association are **Dale Rodman,** Ohio Oil Co., vice president; and **Lloyd Bosworth,** California Standard, secretary-treasurer. Executive committee members include **Bill Castle,** Richfield Oil Corp.; **Pat Wright,** Superior Oil Co.; **Walker Locke,** Shell Oil Co.; **Sam Tate,** Humble Oil & Refining Co.; **Gene Johnson,** Shell; **Lou Taylor,** Tidewater Oil Co.; and **M. C. Barnard,** Richfield.

George E. Best, Solvay Process division, Mutual Chemical Co., Syracuse, N. Y., has been elected vice president and a director of the National Association of Corrosion Engineers. He will take office March 20. Other new board members are **Jack P. Barrett,** Pan American Petroleum Corp., Tulsa; **Edward L. Simons,** General Electric Research Laboratory, Schenectady, N. Y., and **Guy F. Williams,** Dowell, Inc., Tulsa. Six regional board members also will be named to the 21-member board prior to NACE's annual conference March 16-20 at the Hotel Sherman in Chicago.

▶▶▶ Personals

BOWEN

Frank W. Bowen, refinery engineer at Sun Oil Co.'s Marcus Hook, Pa., refinery, has been named assistant to the vice president in charge of manufacturing. He succeeds **W. Henry Linton,** who has retired after 40 years with the company. **William A. Ackerman,** manager of the technical service division at Marcus Hook, will succeed Bowen as refinery engineer there. **Jack A. Guthrie,** section chief in the technical service division, will replace Ackerman. Bowen joined Sun in 1939 as a chemical engineer. He was superintendent of the Sarnia, Ont., refinery of Sun Oil Co., Ltd., before assignment at Marcus Hook. Linton had been Sun's vice president in charge of manufacturing since 1947. He joined the company in 1919.

Benjamin F. Hoffacker, Jr., formerly with Seaboard Oil Co. in Abilene, Tex., has joined Lion Oil Co. division of Monsanto Chemical Co. He will be in the Midland, Tex., production and exploration department.

Alfred A. Kiltz, assistant manager of the petroleum department of Indiana Farm Bureau Cooperative Association, Inc., has been promoted to manager. He also becomes assistant general manager of Farm Bureau Oil Co., Inc., a pipeline subsidiary. Kiltz succeeds **A. L. Stallings,** who has retired. Stallings had been petroleum department manager for the company since 1947.

John M. Kindle has been named vice president in charge of transmission for Lone Star Gas Co. and vice president and a director of Lone Star Producing Co. He succeeds **Julian L. Foster,** who has retired. Kindle had been superintendent of operations in the transmission and gas-supply divisions of both companies since 1954. He was superintendent of gasoline departments for both companies before that time. Foster, retiring vice president, joined Lone Star in 1918. He has served as assistant general superintendent of the operating department, chief engineer of the transmission division, and general superintendent of transmission. He became vice president and a director of Lone Star Producing in 1952 and vice president in charge of transmission for the parent company in 1954.

▶▶▶ Personals

R. Tesoro, chief processing engineer at Jefferson Chemical Co.'s Port Neches, Tex., plant, and **R. H. Darling,** chief engineer, engineering and maintenance division, have been named assistant plant managers. Tesoro will be assistant plant manager, operations. Darling will be assistant plant manager in charge of engineering, construction, and maintenance. In other changes, **E. R. Cobb,** process group leader, has moved up to succeed Tesoro as chief processing engineer. **C. H. Moore,** formerly on assignment as engineering

TESORO

DARLING

representative in New York, has been named chief engineer in the engineering and maintenance division, succeeding Darling. Tesoro, a graduate of Rice Institute and Massachusetts Institute of Technology, joined the company in 1948 in Port Arthur, Tex. He was assigned to the Neches plant in 1954. Darling joined The Texas Co. in 1935. He was supervisor of plans and coordination until being transferred to Jefferson Chemical in 1955. He is a graduate of Alabama Polytechnic Institute. Cobb has been with the company since 1947, Moore, since 1949. Cobb had been process engineer, quality control supervisor, and process group leader at Port Neches before his recent appointment. Moore was plant engineer and assistant chief engineer at the Port Neches plant before assignment to New York.

W. R. Bilbo, district superintendent with Interstate Oil Pipe Line Co. in Raceland, La., has been promoted to assistant general superintendent in Shreveport, La.

Patrick J. Colombo, project engineer with Standard Oil Co. (Ind.), has been promoted to plans division supervisor in the crude oil coordination department. He succeeds **Joseph J. Pope,** who has joined Amoco Trading Corp., Indiana Standard subsidiary. A graduate of Illinois Institute of Technology and the University of Chicago, Colombo joined Indiana Standard in 1952.

E. W. Bergquist, district superintendent for Interstate Oil Pipe Line Co., has been transferred to Raceland, La., from Vivian, La.

Robert Storch, vice president of Alex W. McCoy Associates, Inc., has been transferred to Tulsa from Denver in a move which closes McCoy's Denver office.

Walter Cassida, drilling foreman with Continental Oil Co. in Durango, Colo., has been transferred to Continental Pipeline Co. as staff engineer in Ponca City, Okla.

Robert L. Kerr, Jr., has been named superintendent of the power department at Atlantic Refining Co.'s Philadelphia refinery. He succeeds **C. H. Brown,** who has retired.

Mike Padden, formerly geologist with Continental Oil Co. in Casper, Wyo., has joined Petrobras, Brazilian government oil agency, in Belem, Brazil. **Bob McCain,** formerly geologist with Lion Oil division of Monsanto Chemical Co., has joined Petrobras in Salvadore, Brazil.

H. C. Tett, chief executive and a managing director of Esso Petroleum Co., has been elected chairman and managing director. He succeeds **Sir Leonard Sinclair,** who has retired after 50 years with the company. Tett joined Esso Petroleum in 1928. He was appointed managing director of Esso Development Co., European research affiliate of the Esso group, in 1947. He returned to Esso Petroleum in 1949 as general sales manager. In 1951 he was named a director. He became a managing director in 1956 and chief executive of the company in 1957.

Six Oklahomans and four Kansans have been named to the Oklahoma-Kansas subcommittee of the Oil Industry Conservation Forum by Chairman **L. E. Fitzjarrald** of Phillips Petroleum Co., Bartlesville. The subcommittee will meet January 21 in Oklahoma City. Oklahomans named to the regional subcommittee are **Paul R. Schultz,** Blackwell Oil & Gas Co., **F. H. Rhees,** Sinclair Oil & Gas Co., and **Paxton Howard,** Shell Oil Co., all of Tulsa; **J. A. Cleverley,** Cities Service Oil Co., Bartlesville; and **K. W. Bolt,** Pan American Petroleum Corp., and **R. A. Hefner, Jr.,** both of Oklahoma City. Kansans are **Pierce C. Musgrove**, Musgrove Petroleum Corp.; **Kenneth Rupp,** Rupp-Ferguson Oil Co., **A. E. Collins,** Vickers Petroleum Co., and **Paul B. Shiven,** Petroleum, Inc., all of Wichita.

Fred E. Hawkins, engineer at Great Lakes Pipe Line Co.'s West Tulsa pumping station, has retired. Hawkins joined Great Lakes in Tulsa in 1931. He was chief engineer at the Latimer, Iowa, station for many years.

C. Turner Harding, assistant manager of engineering coordination for Esso Research & Engineering Co., has taken on additional duties as chairman of the security committee of Standard Oil Co. (N. J.). He succeeds **Donald L. Ferguson,** who will retire March 1. The security committee, organized in 1950, is responsible for plans to keep company operations going in case of disaster. Jersey Standard and its four affiliates in the New York area have representatives on the committee. Harding has been with Esso Research since 1931.

W. W. Clawson, vice president and a director of Magnolia Petroleum Co., has been named senior vice president in charge of all producing operations including exploration, exploitation, research, and natural-gas departments. Clawson joined Magnolia in 1933. He was chief geologist of the company when he was named Pegasus division manager in Billings, Mont., for the parent company, then Socony-Vacuum Oil Co. He also became president of Socony-Vacuum Exploration Co. In 1955 when Mobil Producing Co. was formed to take over operations of the Pegasus division, Clawson was named president of the new company. In 1956 he was appointed coordinator of domestic production for Socony Mobil Oil Co. in New York. He moved to Dallas as vice president and a director of Magnolia in 1957.

Dr. William E. Bradley, manager of research for Union Oil Co., has been elected 1959 chairman of American Chemical Society's division of petroleum chemistry. He succeeds **Harold M. Smith,** assistant supervising engineer of the U. S. Bureau of Mines, Bartlesville, Okla. **Wheeler G. Lovell,** director of automotive products development of Ethyl Corp., has been named chairman-elect of the division. **Dr. Bernard M. Sturgis,** Du Pont, and **Dr. H. J. Passino,** M. W. Kellogg Co., will continue as secretary and treasurer. Bradley joined Union in 1931. He became assistant to the manager of research in 1941, assistant to the vice president in 1948, and manager of research in 1951.

Edward A. Pullen has been promoted to senior research chemist at Union Oil Co.'s Brea, Calif., research center.

Gael M. Williams, research engineer with California Research Corp., has been promoted to group supervisor in the Richmond, Calif., laboratory's plant technical service division. Williams has been with the company since 1952.

Marvin Zeid, formerly senior reservoir engineer in Houston for El Paso Natural Gas Co., has joined Texas Gulf Producing Co. in Houston as petroleum reservoir engineer. Zeid was with Brazos Oil & Gas Co. and Atlantic Refining Co. before joining El Paso.

Robert O. Garrett, vice president and general manager of Texas Gas Exploration Co., has been elected president of the company, a subsidiary of Texas Gas Transmission Corp. Garrett will continue as general manager and a director. Garrett was manager of the exploration and production engineering departments of Arkansas Louisiana Gas Co. before joining Texas Gas Exploration.

John H. Easthagen has been promoted to staff engineer for industrial pollution control with California Research Corp. He will act as a consultant to California Research and the parent company, Standard Oil Co. of California.

David B. Schulz has joined B B M Drilling Co. as West Texas division drilling superintendent. He will headquarter in Midland, Tex. A graduate of Colorado School of Mines, Schulz was formerly with George P. Livermore, Inc., Lubbock, Tex., and Dixon Drilling Co., Abilene, Tex.

Gene Richards and **V. T. McCauley,** Atlantic Refining Co. geologists in Bismarck, N. D., have been transferred to Billings, Mont. **Jack McMillan,** district landman in Bismarck, has been transferred to Midland, Tex. The Bismarck office closed January 1.

Edwin A. Ritz, manager of Clark Oil & Refining Corp.'s St. Paul, Minn., district, has been named manager of the company's new St. Louis marketing region. **James J. Keating,** Milwaukee district manager, will succeed Ritz in St. Paul. **P. A. Treiber** will replace Keating in Milwaukee.

▶▶▶ Personals

James I. Harper, president of Sun-Olin Chemical Co., subsidiary of Sun Oil Co. and Olin Mathieson Chemical Corp., has been named coordinator of chemical manufacturing and sales for Sun Oil Co. A graduate of Rensselaer Polytechnic Institute, Harper joined Sun in 1936. He became assistant director of the research and development division in 1953. In 1956 he was named assistant superintendent, petrochemicals, at the Marcus Hook, Pa., refinery. He was elected president of SunOlin when it was founded several months ago.

Thomas F. Neal, manager of Sun Oil Co.'s Chicago sales district, has been appointed assistant manager of the Middle Atlantic sales region. He succeeds **John K. McKee,** who was recently appointed manager of the Ohio Valley sales region. **David H. Durham,** manager of retail sales in the central region, will succeed Neal in Chicago.

▶▶▶ Deaths

O. W. Killam, 84, Laredo, Tex., independent operator and owner of Texpata Pipeline Co., died January 1. Killam was credited with bringing in the first commercial well south of San Antonio in Jim Hogg County, Texas. He discovered the Mirando Valley and Schott fields in this area. A graduate of the University of Missouri, he moved to Oklahoma before statehood and served as a member of the territorial legislature and statehood commission.

William C. Lane, 51, manager of foreign trade for Standard Oil Co. of California, died December 31 after a heart attack at his home in San Mateo, Calif. Lane joined California Standard in 1926 on a part time basis before his graduation from the University of Washington. He became assistant foreign trade manager in 1946 and manager in 1956.

Edwin A. Parkford, 74, California independent operator, died January 3 at Rancho Santa Fe, Calif., after a long illness. Parkford entered the drilling business 40 years ago in the Bakersfield, Calif., area. In recent years he had been active in Canadian development.

Joseph E. Bennett, 47, vice president of Tejas Oil & Gas Co., Houston, died December 29 in Houston. Bennett did land and title work for Gulf Oil Corp. in Houston for many years. He had been with Tejas for the past 3 years.

Dorsey E. Kinney, Houston oil operator, died December 31 in a Houston hospital from injuries received in an automobile accident November 29.

Paul B. Leavenworth, 60, manager of exploration for Housh Drilling Co. and former chief geologist for Gulf Oil Corp., died December 31 of a cerebral hemorrhage. Leavenworth joined Housh in 1950 after 30 years with Gulf.

Charles C. Klein, 73, retired treasurer and assistant secretary of the old Mid-Continent Petroleum Corp., died December 2 in a Tulsa hospital. Klein retired in 1955.

David C. Miller, 76, drilling contractor in the Tulsa area in the 1920's and later production engineer with the U. S. Corps of Engineers, died January 5 in Tulsa. Miller retired from the Corps of Engineers in 1955.

N. H. Richardson, gang pusher in Standard Oil Co. of California's southern division production department, died January 3 in Los Angeles. He was 51.

Vincent J. Nolan, 56, president of Erie Pipe Line Co., Mount Vernon, Ill., died December 12 in Mount Vernon.

C. E. McClure, Bellaire, Tex., vice president of Lorac Service Corp., died January 4 at Marathan Key, Fla., while on a business trip. McClure joined Seismograph Service Corp. in 1936. He became vice president of Lorac, a Seismograph subsidiary, in 1956.

George Bean, director in charge of sales for Houston Oil Field Material Co., died January 2 in Houston after a long illness. Bean, 50, had been with Homco for 24 years.

Charles Kenneth Bell, 42, assistant secretary and assistant treasurer of Reed Roller Bit Co., died January 5 at his Houston office after a heart attack. Bell had been with Reed Roller Bit 18 years. He was a graduate of Rice Institute.

▶ ▶ ▶ Statistical Section

Icy blasts boost distillate demand

BY JOHN C. CASPER

DOMESTIC DEMAND for middle distillate set a new all-time record in December, according to preliminary estimates based on weekly data. The average for the month was almost 3,650,000 bbl. daily compared with the previous record of 3,562,000 bbl. daily for January 1957.

The big gain can be credited to weather. Old Man Winter saved most of his low temperatures and dumped them in December.

Based on degree-days, December in Boston was 55.7% colder than a year earlier and 19.5% colder than normal. Weather in the New York City area was colder by about 17.5%. The unweighted average for Boston, New York, Philadelphia, Pittsburgh, and Washington shows that weather in the northeastern part of the country was about 20% colder than normal.

The average number of degree-days in December for eight large metropolitan areas in the North Central part of the country was up 17% from normal and 32% from December 1957.

These areas are the big distillate-consuming districts of the country. Colder weather here means good gains in heating-oil sales.

This cold December weather was an added dividend for suppliers on top of normal increases due to new users. Demand for distillate in all areas of the country showed a gain in December of 26.5% compared with December 1957.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,133,344	UP	2,419	UP	294,772
Crude stocks	263,179,000	UP	318,000	DOWN	13,054,000
Completions	464	DOWN	759	DOWN	46
Refinery runs	8,256,000	UP	91,000	UP	389,000
Gasoline stocks	181,913,000	UP	5,278,000	DOWN	11,122,000
Kerosine stocks	26,057,000	DOWN	98,000	DOWN	2,454,000
Distillate stocks	126,056,000	DOWN	4,354,000	DOWN	23,965,000
Residual stocks	60,525,000	DOWN	1,104,000	UP	904,000
Four-product stocks	399,551,000	DOWN	278,000	DOWN	36,637,000
Total imports	2,145,100	UP	113,500	UP	362,400

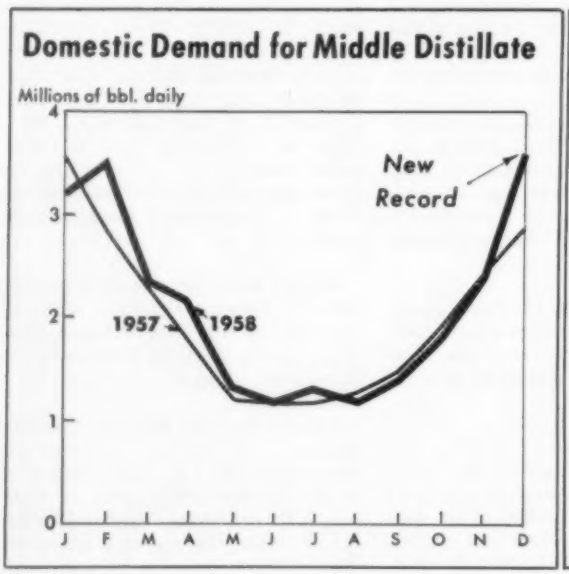
Despite the warm weather in October and November, middle-distillate demand for the fourth quarter was up 10.3% over the corresponding period of 1957.

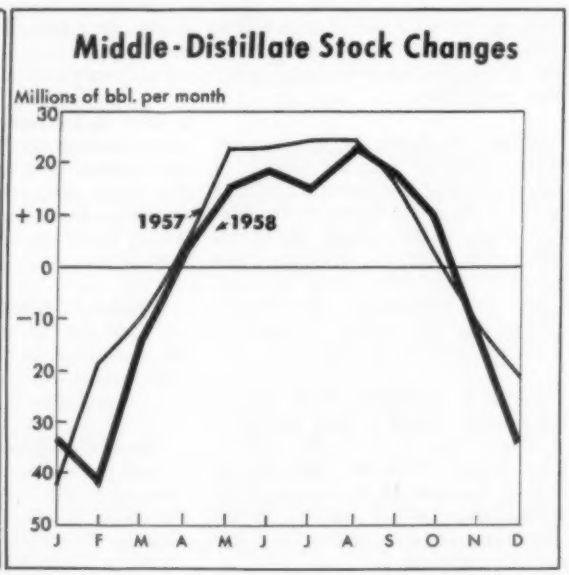
The gain of 5.5% in the first quarter of the year was due to cold weather in February and March. Sales in January were no better than average. The big boost came in February, and deliveries climbed to 3,525,000 bbl. daily.

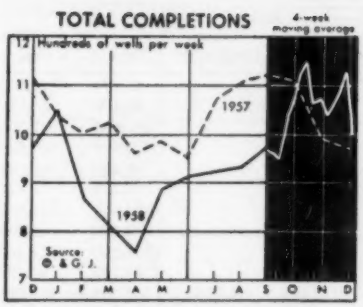
For the full year, the gain for middle distillate amounted to 6.3%, but the gain in the fourth quarter was the only one to exceed the average gain for the year.

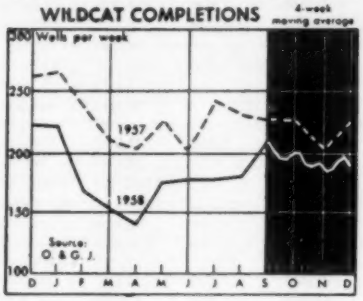
Stock reductions . . . The chart on the right shows that stock cuts were greater or stock additions were smaller than the year before in 9 out of the 12 months. The big reductions were in February and December. Note that stock withdrawals in February were almost 22 million barrels more than in February 1957. The extra drawdown amounted to 13 million barrels in December.

Distillate prices . . . Good demands and heavy stock reductions have strengthened prices in recent weeks. Higher prices on the East Coast triggered gains on the Gulf Coast market. Late reports indicate another increase on the Gulf Coast, this time for 0.125 cent a gallon. Group 3 movement and prices have been good for several weeks.









Active Rotary Rigs*

	1-5-59	12-29-58	1-6-58
Alabama	8	10	8
Arkansas	15	24	18
Arizona	....	....	....
California	87	85	91
Land	82	(†)	(†)
Offshore	5	(†)	(†)
Colorado	31	38	33
Florida	1	....	1
Illinois	42	49	44
Indiana	2	7	3
Iowa	3	3	2
Kansas	141	151	118
Kentucky	6	8	8
Louisiana	329	325	374
North	37	36	35
S. Inland waters	138	138	(‡)
S.-Land	122	113	261
Offshore	32	38	78
Maryland	2	2	1
Michigan	12	9	7
Missouri	1	1	....
Montana	18	19	29
Mississippi	57	65	54
Nebraska	19	20	21
Nevada	....	....	....
New Mexico	102	97	129
New York	....	....	1
North Dakota	33	32	43
Ohio	2	2	1
Oklahoma	194	234	220
Oregon	....	....	....
Pennsylvania	10	9	7
South Dakota	....	....	1
Texas	784	866	865
S.-Inland waters	4	6	(‡)
S.-Land	150	180	191
Offshore	2	1	3
North-East	168	189	(†)
West Central	301	326	(†)
West	159	164	(†)
Utah	35	34	50
Washington	....	....	1
W. Virginia	3	3	2
Wyoming	68	78	50
Total U. S.	2,005	2,171	2,182
Western Canada	193	193	189
Eastern Canada	....	....	2
Grand total	2,198	2,364	2,373

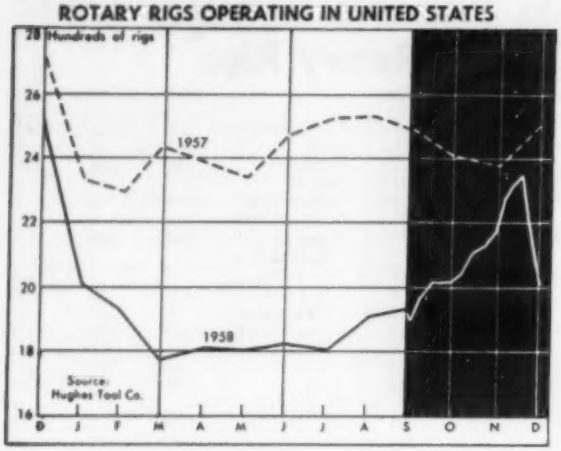
*Hughes Tool Co. †Comparisons not available due to change in method of reporting. ‡Included in South-Land.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 3, 1959

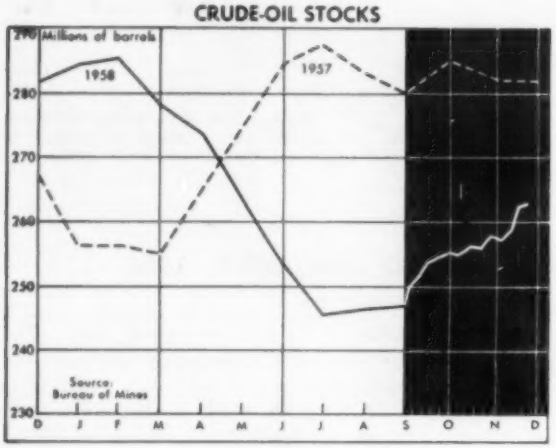
	Total wells							Total wildcats				
	Total	Crude	Cond.	Gas	Dry	Service	Footage	Total	Crude	Cond	Gas	Dry
Alabama	4	3	0	0	1	0	39,104	1	0	0	0	1
Arkansas	19	8	0	0	11	0	78,388	5	0	0	0	5
California	49	37	0	0	12	0	227,088	10	1	0	0	9
Colorado	11	1	0	1	9	0	59,364	6	0	0	1	5
Illinois	41	8	0	0	20	13	94,740	9	0	0	0	9
Indiana	11	3	0	2	6	0	13,352	3	0	0	0	3
Kansas	81	38	0	5	35	3	279,317	22	6	0	1	15
Kentucky	29	4	0	9	16	0	63,297	2	0	0	0	2
Louisiana	31	12	0	2	17	0	128,419	11	0	0	0	11
North	31	12	0	2	17	0	128,419	11	0	0	0	11
South	Not available											
Offshore	Not available											
Michigan	16	4	0	4	8	0	43,751	3	1	0	1	1
Mississippi	11	4	0	0	7	0	86,289	7	1	0	0	6
Montana	9	7	0	0	2	0	36,279	1	0	0	0	1
Nebraska	7	1	0	0	6	0	39,646	3	0	0	0	3
New Mexico	Not available											
New York	5	3	0	0	0	2	7,000	0	0	0	0	0
North Dakota	7	5	0	0	2	0	41,564	2	1	0	0	1
Ohio	0	0	0	0	0	0	0	0	0	0	0	0
Oklahoma	96	46	1	5	43	1	380,116	25	9	0	0	16
Pennsylvania	0	0	0	0	0	0	0	0	0	0	0	0
Texas	Not available											
Utah	5	3	0	0	2	0	26,745	2	0	0	0	2
West Virginia	19	2	0	12	5	0	43,289	1	0	0	1	0
Wyoming	10	3	0	2	5	0	47,940	5	1	0	1	3
Miscellaneous (S. D.)	3	1	0	0	2	0	10,834	2	0	0	0	2
Total United States	464	193	1	42	209	19	1,746,522	120	20	0	5	95
Total previous week	1,223	514	34	66	599	10	4,390,269	238	21	7	4	206

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*
(Thousands of barrels)

	12-27-58	12-20-58	12-28-57
Pennsylvania	2,613	2,693	3,039
Other Appalachian	1,648	1,628	1,715
Illinois, Indiana, Michigan	10,194	10,004	11,481
Nebraska and North Dakota	2,489	2,475	2,437
Kansas	10,299	10,348	9,757
Oklahoma	16,585	16,762	19,756
Arkansas	2,103	2,266	2,766
Louisiana	17,394	16,991	19,448
North	2,946	2,931	2,801
South	14,448	14,060	16,647
Mississippi, Alabama, Florida	2,422	2,272	2,545
New Mexico	8,166	8,446	9,502
Texas	117,146	116,543	122,418
East Texas	8,532	8,563	8,940
West Texas	57,552	58,111	55,255
Texas Gulf	20,361	19,813	24,792
Other Texas	30,701	30,056	33,431
Wyoming	13,542	13,132	13,641
Other Rocky Mountain	9,531	9,462	6,812
California	33,942	33,857	34,986
Foreign	†15,105	15,982	15,930
Total	**263,179**	262,861	276,233

*Burea of Mines. †Includes 4,934,000 bbl. in California.

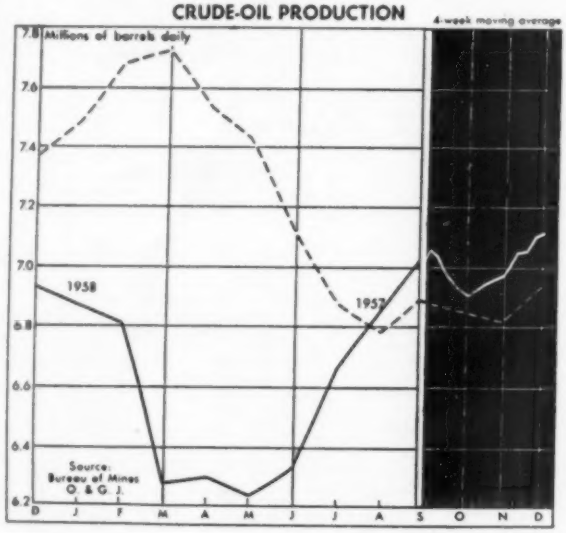
DAILY AVERAGE PRODUCTION FOR WEEK

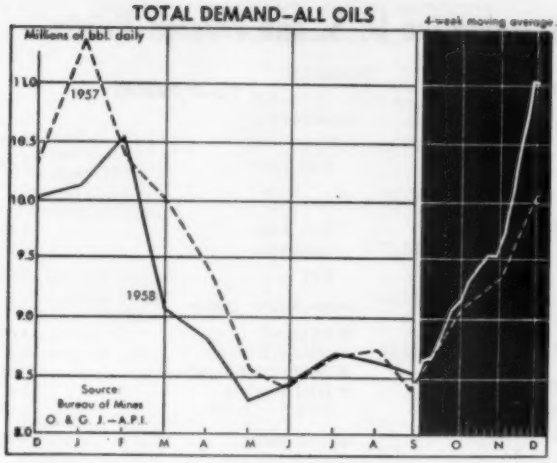
	January 3, 1959			Dec. 27
	Crude oil	Lease condensate	Total	total
Alabama	16,100	.....	16,100	16,000
Arkansas	86,275	125	86,400	86,525
California	854,000	.....	854,000	853,200
Colorado	129,400	.....	129,400	129,800
Eastern	40,800	.....	40,800	40,100
Florida	1,225	.....	1,225	1,225
Illinois	224,000	.....	224,000	222,900
Indiana	32,600	.....	32,600	32,700
Kansas	†331,200	.....	†331,200	†324,500
Kentucky	65,700	.....	65,700	65,400
Louisiana	830,825	101,900	932,725	923,050
North	110,600	3,900	114,500	114,450
South	720,225	98,000	818,225	808,600
Michigan	24,200	.....	24,200	22,900
Mississippi	114,725	5,250	119,975	119,450
Montana	77,000	.....	77,000	77,600
Nebraska	59,600	.....	59,600	60,000
Nevada	100	.....	100	100
New Mexico	275,350	6,400	281,750	281,800
North Dakota	39,500	.....	39,500	39,000
Oklahoma	†548,800	.....	†548,800	†565,300
Texas	2,773,725	68,400	2,842,125	2,838,000
Dist. 1	44,425	1,600	46,025	46,450
Dist. 2	121,425	8,500	129,925	130,000
Dist. 3	381,575	33,500	415,075	414,000
Dist. 4	197,000	7,600	204,600	204,500
Dist. 5	31,000	500	31,500	31,400
Dist. 6	121,275	7,400	128,675	128,300
East Texas field	160,300	.....	160,300	160,000
Dist. 7-B	141,300	150	141,450	141,100
Dist. 7-C	139,275	3,850	143,125	142,850
Dist. 8	1,118,575	2,800	1,121,375	1,118,000
Dist. 9	214,300	1,500	215,800	217,500
Dist. 10	103,275	1,000	104,275	103,900
Utah	87,200	.....	87,200	85,800
Wyoming	338,700	.....	338,700	335,500
Others	‡244	.....	‡244	‡75
Total U. S.	6,951,269	182,075	**7,133,344**	7,130,925
Change from prev. week up		.....	**2,419**	.....
Canada	§	.....	§	†515,700

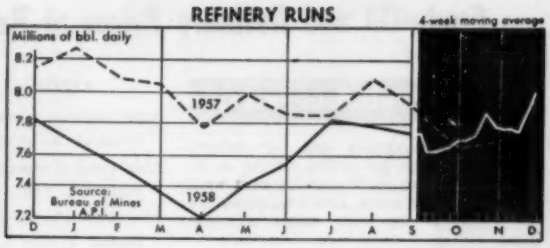
Total U. S. Prod.-Jan. 1-Jan. 3 ..... 21,400,032 bbl.
Same period last year (crude plus cond.) ..... *20,515,716 bbl.

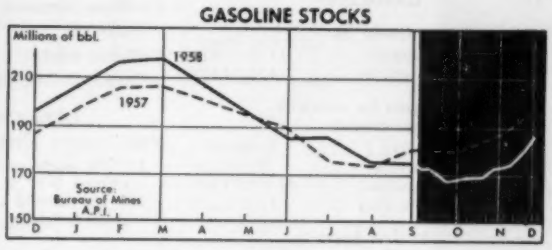
*Includes 480,975 bbl. condensate. †Week ended previous Monday. ‡South Dakota, Washington, and Arizona. §Production reports delayed.

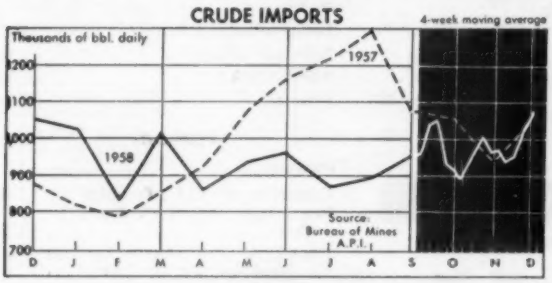
CRUDE-OIL PRODUCTION

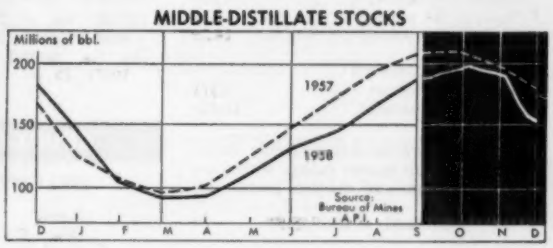


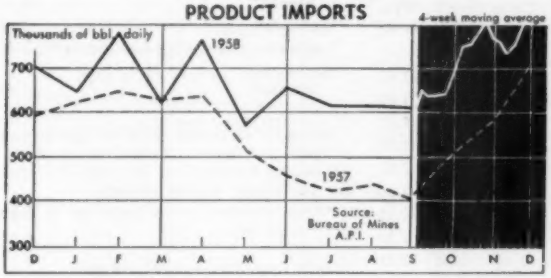


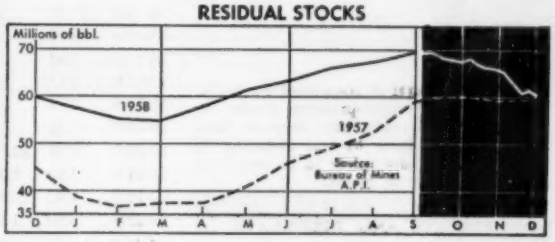












API REFINERY REPORT—JANUARY 2, 1959

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, January 1958 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,180	578.0	88.7	415.0	160.9	42,033	10,815	45,337	10,846	1,151	502.9	35.5	338.9	194.5
Appalachian:														
Dist. 1	98	38.0	7.3	21.7	10.7	4,770	474	2,944	337	99	40.5	4.5	25.1	9.3
Dist. 2	101	54.0	4.6	18.7	17.3	2,482	395	1,223	206	93	53.4	6.8	17.4	11.1
Ind., Ill., Ky.	1,509	732.7	94.6	361.9	192.6	31,523	5,972	22,054	4,494	1,408	709.1	77.8	322.0	192.2
Minn., Wis., Dak.	114	53.3	6.1	28.0	12.7	6,804	1,115	6,536	563	109	50.9	5.8	29.1	13.5
Okla., Kans., Mo.	765	433.3	24.3	199.4	33.6	18,118	1,387	10,116	983	736	416.5	17.7	195.3	41.5
Inland Texas	297	211.6	3.3	53.9	24.7	7,578	352	2,328	2,237	277	192.4	11.1	51.3	20.8
Texas Gulf Coast	1,996	1,016.1	122.6	575.0	215.1	25,744	2,365	11,998	6,209	1,757	870.6	128.8	472.3	206.3
La. Gulf Coast	674	390.3	68.3	167.3	51.1	11,560	1,522	5,977	1,660	596	349.1	55.7	132.2	36.2
N. La. and Ark.	85	43.3	5.4	21.4	5.3	4,777	1.040	2,104	65	95	38.1	8.4	19.1	9.2
Rocky Mountain:														
New Mexico	25	13.6	0.4	4.1	2.0	667	36	147	37	23	11.3	0.3	4.3	2.7
Other Rky. Mt.	278	129.0	3.6	66.6	32.9	5,396	228	2,724	848	265	124.4	3.9	64.7	37.7
West Coast	1,134	551.7	10.8	151.7	249.1	25,461	356	12,568	32,040	1,063	467.9	5.1	169.1	313.7
Jan. 2, 1959	8,256	4,244.9	440.0	2,084.7	1,008.0	186,913	26,057	126,056	60,525	7,672	3,827.1	361.4	1,840.8	1,088.7
Dec. 26, 1958	8,165	4,157.9	374.4	2,029.7	1,141.0	181,635	26,155	130,410	61,629	.....	.....	.....	.....	.....
Jan. 3, 1958	7,867	3,941.6	369.9	1,891.4	1,127.4	198,035	28,511	150,021	59,621	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.50-11.625
Premium (99 octane)	14.50-14.625
Gulf Coast (cargoes for coastwise or export movements):	
★ Regular (90 octane)	10.00-10.25
★ Regular (92 octane)	10.25-10.50
★ Premium (97 octane)	11.375-11.625
★ Premium (98 octane)	11.50-11.75
California (rack) (Los Angeles):	
Regular (88 octane)	12.25
Premium (94 octane)	13.25
Premium (98 octane)	14.25
Caribbean area (cargoes):	
Regular (87 octane)	9.875
Premium (97 octane)	11.625

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
★ Kerosine 42-44	10.50
★ Diesel oil (58 d.i. and above)	10.25
★ Distillate No. 1	10.25
★ Distillate No. 2	9.50
Gulf Coast (cargoes):	
★ Kerosine 41-43	9.875
★ Distillate No. 2	9.375
New York Harbor (barges):	
Kerosine 41-43	11.00
Distillate No. 2	10.50
Diesel fuel, 48-52 d.i.	10.75
Caribbean area (cargoes):	
★ Distillate No. 2	9.375

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank car	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.70-1.80
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
Bunker C fuel	$2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 pp., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 pp., 95 v.i.	20.5
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22
200 vis. neutral (180° at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$1.86	....	....	....	....
15-15.9	1.95	....	....	....	$1.81
16-16.9	2.04	....	....	....	1.86
17-17.9	2.13	....	....	....	1.91
18-18.9	2.23	....	....	....	1.96
19-19.9	2.32	....	....	....	2.01
20-20.9	2.41	$2.52	....	$2.62	2.06
21-21.9	2.50	2.55	....	2.64	2.11
22-22.9	2.60	2.58	....	2.66	2.16
23-23.9	2.69	2.61	$3.44	2.68	2.21
24-24.9	2.78	2.64	3.46	2.70	2.26
25-25.9	2.87	2.67	3.48	2.72	2.31
26-26.9	2.96	2.70	3.50	2.74	2.36
27-27.9	3.06	2.73	3.52	2.76	2.49
28-28.9	3.11	2.76	3.54	2.78	2.54
29-29.9	3.16	2.79	3.56	2.80	2.59
30-30.9	3.22	2.82	....	2.82	2.63
31-31.9	3.27	2.85	....	2.84	2.67
32-32.9	3.33	2.88	....	2.86	2.71
33-33.9	3.38	2.91	....	2.88	2.75
34-34.9	3.44	2.94	....	2.90	2.79
35-35.9	3.49	2.97	....	2.92	2.83
36-36.9	3.55	3.00	....	2.94	2.87
37-37.9	3.60	3.02	....	2.96	2.89
38-38.9	....	3.04	....	2.98	2.91
39-39.9	....	3.06	....	3.00	2.93
40-44.9	....	3.08	....	3.02	2.95

*Another Oklahoma (sweet) schedule has a top of $3.05 with different gravity variations to $2.34 for below 20°. †Low cold test crude. ‡Sour.

Effective dates of broad changes: California, 9-30-58; East of California, January 3-10, 1957; Pennsylvania Grade 12-22-58.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Ville Platte	3.30
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
★ Bradford	4.05
★ Middle District	3.87
★ Southwest Pennsylvania	3.58
★ West Virginia	3.40
Buckeye Grade	3.25
Illinois Basin	**3.00**
Canada:	
Leduc-Woodbend	2.67
Redwater (Alta.)	2.56
Smiley (Sask.)	2.33
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.66
San Joaquin, 41°-41.9°, Puerto La Cruz	3.25
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26°-26.9°, Amuay*	2.55
Quiriquire, 16.0°-16.4°, Caripito	2.15
Lagunillas heavy, flat, Las Piedras*	2.10
Bachequero, flat, 15°-16°, Las Piedras*	1.93

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Ababan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.49
Iraq, 36.0°-36.9°, Tripoli, Banias	2.49
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC +16.25%)	$3.31
★ Gulf-U.S.N.H., dirty (ATRS+5%)	2.99
★ Carib.-U.S.N.H., clean (ATRS −42.5%)	1.58
★ P.G.-U.S.N.H., dirty (USMC −70.5%)	3.75
★ Carib.-U.K., clean (ATRS−45%)	3.58

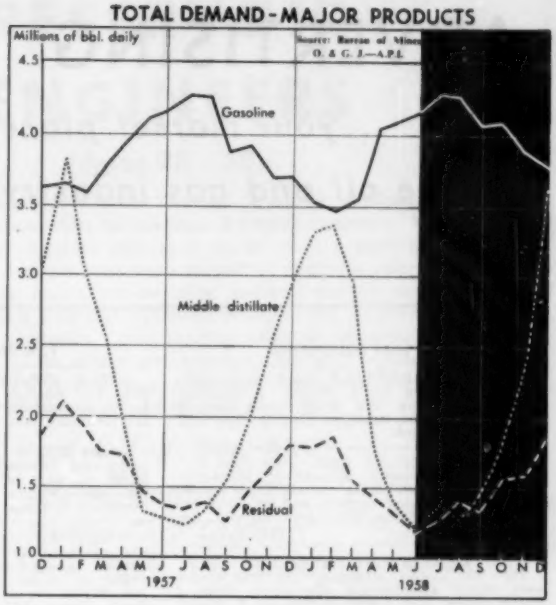
SUPPLY AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

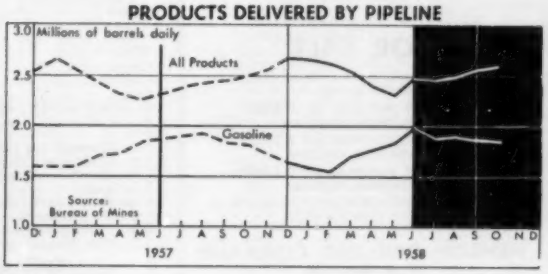
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
December 1958*	3,790	4,100	186,100
November 1958*	3,910	4,010	173,900
October 1958	4,118	3,921	170,120
January 1958	3,523	3,827	207,115
December 1957	3,702	3,956	196,776
KEROSINE			
December 1958*	556	375	26,100
November 1958*	360	335	31,500
October 1958	299	315	31,877
January 1958	565	361	23,073
December 1957	474	356	29,200
DISTILLATE			
December 1958*	3,090	1,980	126,600
November 1958*	2,100	1,825	159,000
October 1958	1,570	1,818	164,686
January 1958	2,748	1,841	122,375
December 1957	2,474	1,886	149,449
RESIDUAL			
December 1958*	1,870	1,045	60,700
November 1958*	1,590	945	65,800
October 1958	1,354	959	67,045
January 1958	1,791	1,089	57,562
December 1957	1,805	1,142	59,959

*Preliminary. †Thousands of barrels.

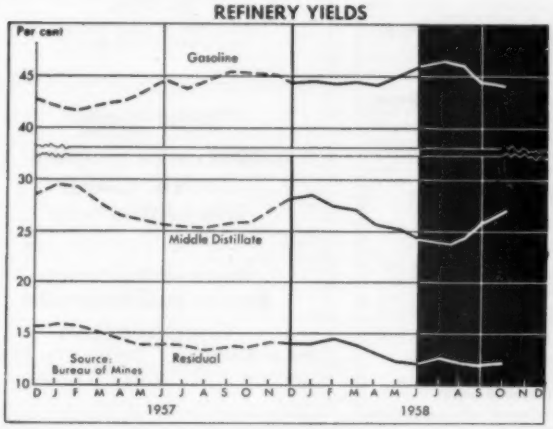
TOTAL DEMAND - MAJOR PRODUCTS



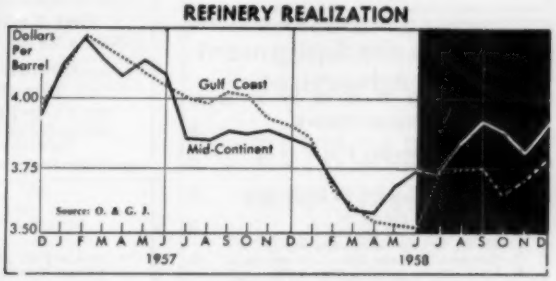
PRODUCTS DELIVERED BY PIPELINE



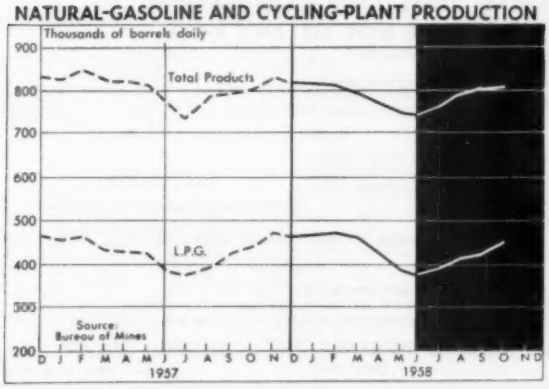
REFINERY YIELDS



REFINERY REALIZATION



NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



REFINERY REALIZATION

	Dec.* 1958	Nov.* 1958	Oct. 1958	Dec. 1957
Mid-Continent	$3.92	$3.81	$3.83	$3.86
Gulf Coast	3.78	3.71	3.60	3.91

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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Replies should include details on education and work experience, references, salary expected, and a small photo if available. All replies will be held in confidence.

Box L-122,

The Oil and Gas Journal,

Tulsa, Oklahoma.

COMPUTER ANALYSTS

Computer Department has several openings for well-qualified operations research analysts to participate in planning and developing complex optimization models, dynamic simulation programs and integrated accounting applications for large tape computer. Candidates must meet following academic and experience requirements:

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Degree in engineering, physical science or economics preferably with math minor, plus experience with refinery process analysis, transportation economics or marketing and distribution.

MATHEMATICIAN OR STATISTICIAN:

Ph.D. in mathematics or statistics with strong background in numerical analysis, matrix algebra or econometrics. Experience with computers desirable, but not essential.

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DESIRE OILFIELD EQUIPMENT lines to represent or responsible sales position. Eighteen years sales and management experience. Well known in Gulf Coast and Mid-Continent. Member API and NOMADS. Now living Houston. Box L-135, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: 38; 14 years drilling, production, reservoir engineering; chief engineer 2½ years. Majority experience in Texas. Box L-128, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, MS degree, registered professional engineer, eight years experience in evaluation and waterflood engineering plus three years as operations manager, presently employed as chief engineer for foreign operation of major. Interested in petroleum engineering or supervisory position. Resume furnished on request. Box L-120, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATION WANTED

GEOLOGIST, Age 49, variable experience of subsurface mapping, reservoir studies, leasing and other exploration functions. Has own well records and subsurface data to evaluate Oklahoma areas. Desires position in Tulsa, Sapulpa or elsewhere. P. O. Box 1884, Tulsa, Okla.

PIPELINE ENGINEER: 15 years responsibility for: Operations, Field engineering, design, development, management. Desire permanent responsible position allied with pipeline industry. Graduate PE, 39, married, will relocate. Now available. Box L-132, The Oil and Gas Journal, Tulsa, Oklahoma.

MATERIALS PURCHASING LIAISON, 37, family, two years foreign experience desires to continue career in either of these fields. Home work preferred. Speak, read, write French, Italian, German. Box L-134, The Oil and Gas Journal, Tulsa, Oklahoma.

STRATIGRAPHER, M.A., 7 years experience Northern U. S., desire relocate Alaska, Pacific Coast or Rocky Mountains, or Foreign. Inquire Box 31 R 276, The Oil and Gas Journal, 4041 Mariton Ave., Los Angeles 8, Calif.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

BUSINESS OPPORTUNITIES

INTEGRATED ORGANIZATION, two geologists, major company and independent experience, one landman, independent experience. Desire financing for Anadarko Basin drilling prospects. Wildcat and semi-proven. Primarily a gas play. Prefer group investment situation with participation for ourselves. References. Box L-124, The Oil and Gas Journal, Tulsa, Oklahoma.

ILLINOIS, MICHIGAN and OHIO territories now open for sales and service organizations to represent us in a complete line of production equipment. Our line of equipment fits in well with practically all production equipment service organizations. Commissions far above average. Box K-985, The Oil and Gas Journal, Tulsa, Oklahoma.

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Box K-994,
The Oil and Gas Journal,
Tulsa, Oklahoma.

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DRILLING BLOCKS assembled or negotiated anywhere on any reasonable basis. We speak foreign languages. (J. W.) Phillips & Ocheltree, Box 1297, Venice, Fla.

WANT SHALLOW ACREAGE for three well test program, offset or extension, preferably farmout. Write U. S. Anderson, 8350 Santa Monica Blvd., Los Angeles 46, California.

OVERLOADED—Oil and Gas Leases. Promising locations, northwest & southwest Kansas. Small payment & small override will handle any lease. Box 274, Sterling, Kansas.

FOR SALE—Government 40 acre oil leases in Arizona, N. M. & Calif. You do no drilling yet. You share in fortunes made from oil on public lands. Payments if desired. Free information & maps of booming areas. Bids now accepted via mail. Real Estate Investments, Ltd., 24 N. Wabash Ave., Rm. 822, Chicago 2, Illinois.

OWNER OF MINERALS, approximately 9,000 acres, Woodward County, Oklahoma. All under lease to major companies; solicits inquiries for sale to prospective purchasers. Box L-131, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW OIL FIELD, Taylor and Green, 200 to 300 bbls. at 460 ft. 26 ft. of sand acreage for sale close in, also want help complete wells—R. T. Gaddie—Campbellsville, Kentucky.

WE OWN, and offer for immediate sale, approximately 8700 acres of federal leases in Mesa County, Colorado, located in Townships 8, 9, and 10 South, Ranges 101 through 103. Elkhorn Oil Company, 1327 Speer Blvd., Denver, Colorado. Phone—AComa 2-7685.

AVAILABLE: Four good drilling deals in Oklahoma. Also clients looking for good leases. Box L-130, The Oil and Gas Journal, Tulsa, Oklahoma.

KENTUCKY—Boom area—6,000 acres leases; shallow drilling; no proration. All or part drilling deal. Address Box L-133, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL LEASE open for bids on Hahn land, Ellis County, Oklahoma. 240 acres, section 9, township 18, range 21. Bettie Campbell, 911 Harding, Canon City, Colorado. Phone 751-J.

FOR SALE—20,000 acres Devonian Trend, Ky. In line with pools that produced 100 Million Bbls. Settled production in Green County, Ky. Many proven locations. Box L-136, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL LAND FOR LEASE
2,000 acres in Fergus County, Montana. Owner, Napoleon G. Plato, 403 N. Lucerne Blvd., Los Angeles 4, Calif. HO 5-4931.

PERSONALS

PAN AMERICAN CONSULTANTS, a newly formed partnership specializing in oil and gas development in Latin America has opened offices in the Maryland Casualty Building in New Orleans, and the Ambar Motor Building in Havana, Cuba. The partnership is composed of John F. Bricker, Management; Fernando Freyre, Legal; James R. Crow, Geological.

BUSINESS OPPORTUNITIES

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Experienced Sales Representatives wanted to sell Crude Oil Metering and Testing Equipment on Commission Basis in following Territories: (1) North Texas, (2) Williston Basin, (3) Southern Louisiana, (4) East Texas, Northern Louisiana, and Southern Arkansas, (5) Mississippi and Alabama, (6) California, (7) Mexico, and (8) Colombia, South America. These Territories available on exclusive protected Contract Basis to Qualified Experienced Men. Equipment includes Vol-U-Meters, Metering Separators, Metering Treaters, Well Testers and other related Equipment. Please give details concerning Sales Experience, Lines Handled, Area Covered, Personal Data, and five References in first reply.

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LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, P. O. Box 777, Salt Lake City 10, Utah. NOTICE IS HEREBY GIVEN that approximately 80 acres of land in One parcel within the known geologic structure of the Ashley Creek Field, Uintah County, Utah, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 1:00 P.M., M.S.T., Thursday, February 5, 1959, when bids will be opened. Full details of the lease offering and how and where to submit bids, may be obtained from the Land Office Manager, 31 Federal Building, Salt Lake City, Utah.

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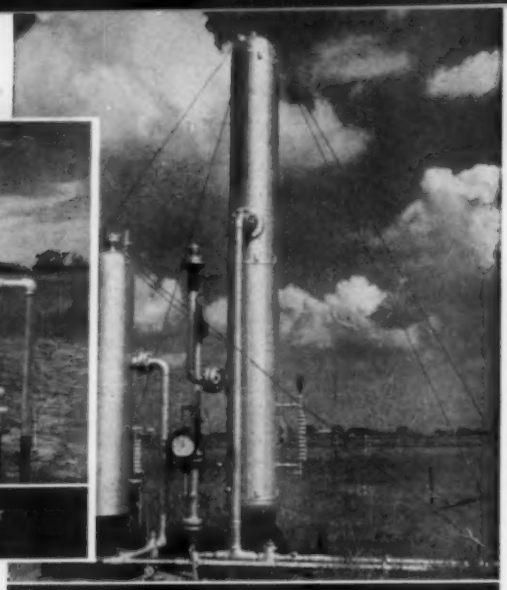

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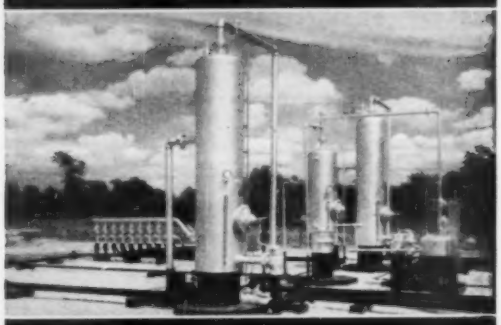

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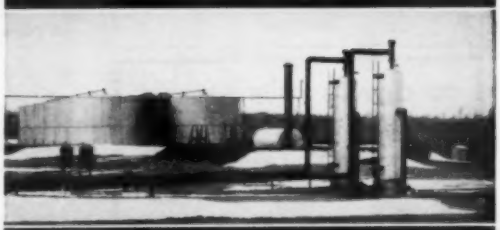

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